DIV. OF FISHES

# COMMERCIAL FISHERIES REVIEW

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Vol. 19, No. 1 JANUARY 1957

FISH and WILDLIFE SERVICE
United States Department of the Interior
Washington, D.C.

UNITED STATES
DEPARTMENT OF THE INTERIOR
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FISH AND WILDLIFE SERVICE

# COMMERCIAL FISHERIES REVIEW

A review of developments and news of the fishery industries
prepared in the BRANCH OF COMMERCIAL FISHERIES

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Mailed free to members of the fishery and allied industries. Address correspondence and requests to the: Director, Fish and Wildlife Service, U. S. Department of the Interior, Washington 25, D. C.

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The printing of this publication has been approved by the Director of the Bureau of the Budget, August 2, 1955. (8/31/57)

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## DEVELOPMENT OF "HONEYCOMBING" IN HAWAIIAN SKIPJACK TUNA


By Tamio Otsu*


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### BACKGROUND

The skipjack tuna (Katsuwonus pelamis) supports the most important fishery in the Hawaiian Islands--landings smount to about 10 million pounds annually. It is abundant during the summer months (May-September), when more than 75 percent of the annual catch is made. Besides the usual problems besetting any fish-

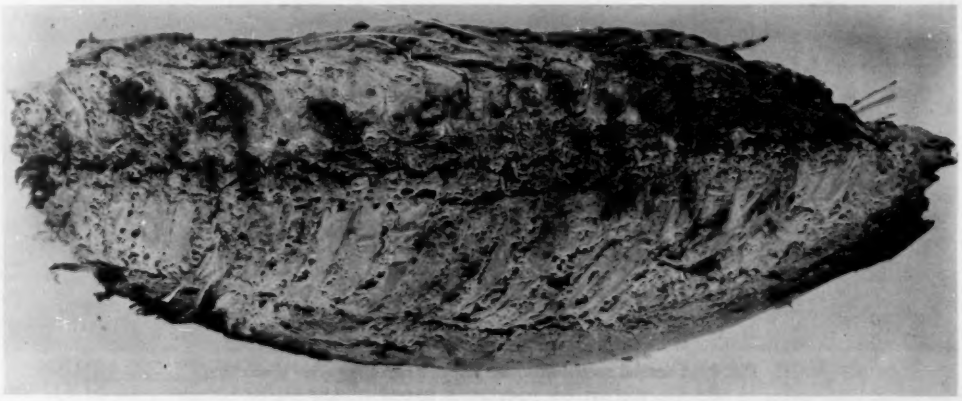

Fig. 1 - An extensively honeycombed skipjack tuna fillet after precooking.

ery, the industry is troubled from time to time with honeycombing, a pitted and cellular condition which appears in some of the fish during precooking, making the meat unsuitable for canning. During 1956 about 58,000 pounds of skipjack were so affected.


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Incidental to studies on skipjack distribution and abundance, the Service's Pacific Oceanic Fishery Investigations conducted several experiments to ascertain whether degree of sexual maturity, size of fish, or type and intensity of refrigeration were related to the appearance of honeycombing during precooking. These experiments suggest that honeycombing is independent of sexual maturity or fish size, but clearly show that it can be induced by holding the fish without refrigeration. Further, they suggest that slight variations in the holding temperature have a striking effect on the length of time required to induce honeycombing, small increases in temperature greatly accelerating the development of the condition. This is believed to be the key to the pronounced seasonality of the problem in Hawaii, where it is significant only during the summer months.

## DESCRIPTION OF HONEYCOMBING

The term "honeycombing" is applied to the meat of cooked fish which is pitted and cellular in appearance. Figures 1 and 2 show an extreme case of this condition as it appears after precooking at the cannery. For comparison, the appearance

Fig. 2 - A closeup of a piece of honeycombed meat taken from the fish shown in figure 1.

of a normal, nonhoneycombed fish after precooking is shown in figure 3. There are various degrees of honeycombing; in some cases a slight trace may appear in the region of the nape, while in others the condition may be found throughout the entire

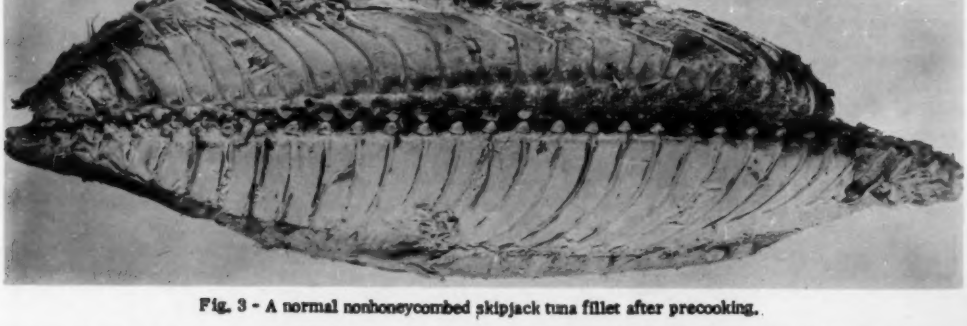

Fig. 3 - A normal nonhoneycombed skipjack tuna fillet after precooking.

body. During the course of the experiments discussed in this paper, it was observed that honeycombing starts at the nape and works posteriorly towards the caudal region. There were also some indications that it begins in the interior of the fish near the backbone and progresses outward.

Honeycombing should not be confused with another condition in the fish in which the meat has a texture variously described as "putty," "mushy," or "jellied." The latter condition is probably caused by sporozoan infection of the muscles as described for yellowfin tuna meat by Arai and Matsumoto (1953).

## SEXUAL MATURITY

PROCEDURE: In order to study the relationship between honeycombing and sexual condition of the fish, 131 female skipjack were examined from a load of fish butchered and precooked on August 11, 1954. Ovaries were collected to determine the degree of ova maturity. When the fish were canned on August 12, they were examined for evidence of honeycombing.

RESULTS AND DISCUSSION: Of the 131 fish, ranging in weight from 14 to 18 pounds, 7 (5.3 percent) were honeycombed. The degree of maturity of these 7 as well as of 19 normal fish was estimated by measuring 10 eggs of the largest group in the ovaries (table 1). The mean size of the largest group of eggs in the ovaries was about the same for all ovaries examined. Furthermore, no gross differences were detected between the ovaries of honeycombed and normal fish; all appeared to be in the same stage of maturity. Hence, this experiment indicated no relationship between honeycombing and the sexual state of the fish.

Table 1 - Results of Ova Measurements Made to Determine Degree of Sexual Maturity of Normal and Honeycombed Female Skipjack Tuna

| Honeycombed Fish | | Normal Fish | |
|---|---|---|---|
| Fish Size (Dressed Weight) | Mean Ova Size | Fish Size (Dressed Weight) | Mean Ova Size |
| Lbs. | mm. | Lbs. | mm. |
| 14 | .587 | - | .572 |
| 14 1/4 | .590 | - | .585 |
| 15 1/2 | .574 | 14 | .605 |
| 16 | .565 | 14 1/4 | .572 |
| 16 | .594 | 15 | .561 |
| 16 1/2 | .574 | 15 | .596 |
| 15 1/2 | .608 | 15 | .563 |
| 15.5 | .585 | 15 1/2 | .592 |
| | | 16 | .601 |
| | | 16 | .598 |
| | | 16 1/2 | .594 |
| | | 16 1/2 | .579 |
| | | 16 1/2 | .594 |
| | | 17 | .598 |
| | | 17 | .609 |
| | | 17 | .607 |
| | | 17 | .576 |
| | | 17 1/2 | .607 |
| | | 17 1/2 | .618 |
| | Mean 16.1 | | .591 |

## REFRIGERATION

Experiments designed to test the effect of refrigeration followed this general pattern: (1) a group of skipjack were taken from a school by live-bait fishing; (2) a portion of the group were frozen within an hour or two as controls; (3) the remainder received various experimental treatments prior to freezing.

EXPERIMENT NO. 1--Crushed Ice vs. Freezing: On July 25, 1954, 66 skipjack (16 to 24 pounds) were taken from a school 60 miles off the southwest coast of the island of Hawaii: 26 were dry frozen within an hour of capture; 1½ hours later the remaining 40 were packed in crushed ice in an unrefrigerated brine well.

The iced fish were repacked the next day, since the ice melted rapidly and many of the fish on the bottom were immersed in water. In order to control this excessive melting, partial refrigeration was resorted to on the morning of July 27,

approximately 45 hours after the start of the experiment. The brine tank temperature was lowered to 40° F. in order to reduce the rate of melting and was occasionally lowered further to 20° F. in order to refreeze the melted ice. Unfortunately, this resulted in freezing the fish, so this experiment in essence tests immediate freezing against 45 hours in crushed ice.

More fish were added to the freezer from another school fished on July 28, bringing the total of dry-frozen fish to 40. These were almost the same size as the first group (15-24 pounds).

The 80 skipjack (40 dry-frozen and 40 "iced") were delivered to the cannery on August 1, a week after the beginning of the experiment. The two groups of fish were butchered and precooked on August 2 in two separate cartloads. They were examined and packed on August 3.

Results and Discussion: All except two fish were in excellent condition. These two, both from the "iced" group, were rejected, one for a very slight trace of probable honeycombing near the nape and the other for a slightly "mushy" texture. The defects in both cases were detected only after the most critical examination.

This experiment indicates no significant difference in the condition of fish frozen immediately after capture and those held in crushed ice for a period of 45 hours prior to freezing.

EXPERIMENT NO. 2--Freezing vs. Holding at Sea-Water Temperature: On August 16, 1954, 80 skipjack (15-32 pounds) were taken 20 miles north of the island of Molokai: 40, selected at random, were frozen within 1½ hours of capture; the remaining 40 fish were held in unrefrigerated circulating sea water for 14 hours (15 hours from capture) before they were frozen. The sea-water temperature during this period ranged between 78.0° F. and 79.0° F. and averaged 78.4° F. This is the type of storage generally used by commercial fishermen in Hawaii for cannery deliveries. The length of time fish are held in sea water prior to delivery at the cannery, where they are held in brine at 32° F., depends on the location of the catch and other operational factors.

Table 2 - Results of Experiment Testing the Condition After Precooking of Fish Frozen Shortly After Capture and Fish Held in Sea Water for 14 Hours Before Freezing

| | Dry Frozen Immediately | | | Held in Sea Water 14 Hours 1/ | | |
|---|---|---|---|---|---|---|
| | Number Rejected 2/ | Number Accepted | Total 3/ | Number Rejected 2/ | Number Accepted | Total 3/ |
| Males | 0 | 18 | 18 | 20 | 3 | 23 |
| Females | 1 | 19 | 20 | 14 | 1 | 15 |
| Total | 1 | 37 | 38 | 34 | 4 | 38 |

1/ These fish were on deck for 1 hour before being stowed. Temperature of sea water ranged from 78.0° F. to 79.02° F., averaging 78.4° F. during the experiment.
2/ Rejected because of honeycombing.
3/ Only 38 of the 40 fish in each lot were followed through the cannery. Identification tags were lost on the remaining 4 fish.

Just prior to freezing, the unrefrigerated fish were somewhat soft, but none emitted any "off" odor nor showed noticeable signs of decomposition. The two groups of fish (40 dry-frozen and 40 held in sea water) were delivered to the cannery on August 30, 1954, and were butchered and precooked on August 31 and canned on September 1.

Results and Discussion: Of the 38 frozen fish followed through the cannery, only 1 (2.6 percent) was found to be honeycombed; of 38 that had been held in sea water, 34 (89.5 percent) were honeycombed (table 2). Size and sex distributions of the two groups were similar (tables 2 and 3). The stomachs of both groups

were generally well filled, and many contained partly digested young skipjack, suggesting that their immediate precapture histories were essentially identical.

This experiment coincided with the peak of the skipjack season, and at the time honeycombing was quite common in the commercial catch, which is held in sea

Table 3 - Size of Fish in the Experiment Testing the Condition After Precooking of Fish Frozen Shortly After Capture and Fish Held in Sea Water for 14 Hours Before Freezing

| | Size Groups (cm.) 1/ | | | | | Not Recorded | Total |
|---|---|---|---|---|---|---|---|
| | 67-70 | 71-74 | 75-78 | 79-82 | 83-84 | | |
| Fish frozen... | 5 | 27 | 3 | 2 | 0 | 1 | 38 |
| Fish held in sea water ... | 9 | 14 | 9 | 5 | 1 | 0 | 38 |

1/ The fish ranged in size from 67 to 84 cm. in total length or approximately 15 to 32 pounds each in weight.

water from the time of capture until delivery at the cannery. The results of this single experiment did not in themselves answer the question of whether or not the skipjack are at this season somehow inherently more susceptible to honeycombing than at other times. They did, however, strongly suggest that the phenomenon could, at this season, be produced to a high degree in one batch of fish and almost completely prevented in another batch of similar fish simply by regulating the temperature at which the fish were held after capture.

EXPERIMENT NO. 3--Varying Time in Sea Water vs. Immediate Freezing: On May 25, 1955, 82 skipjack averaging 7 pounds and ranging from about 5 to 11 pounds in weight were taken a few miles off Oahu. The control group of 32 fish selected at random was frozen within 1 hour after capture. The remaining 50 fish were put in unrefrigerated circulating sea water, and at 5-hour intervals groups of 10 fish were transferred from the sea water to the freezer, the last group being transferred after 25 hours in sea water (26 hours from time of capture). The temperature of the sea water during the 25 hours ranged between 74.7° F. and 75.6° F. and averaged 75.3° F. On May 28, 1955, the 82 experimental fish were delivered frozen and held frozen until June 8 when they were air-thawed; they were precooked on June 9, and examined on June 10.

Results and Discussion: The results (table 4) were in general consistent with those obtained in experiment No. 2. The control group of 32 fish was completely

Table 4 - Results of Experiment No. 3

| Group | Number of Fish | Hours in Sea Water 1/ | Cannery Results | | Remarks 2/ |
|---|---|---|---|---|---|
| | | | Number Honeycombed | Percentage Honeycombed | |
| A | 32 | 0 | 0 | 0.0 | Completely acceptable |
| B | 10 | 5 | 0 | 0.0 | Do. |
| C | 10 | 10 | 0 | 0.0 | Do. |
| D | 10 | 15 | 0 | 0.0 | Do. |
| E | 10 | 20 | 10 | 100.0 | Degree of honeycombing about 80 percent in each fish |
| F | 10 | 25 | 10 | 100.0 | Degree of honeycombing about 95 percent in each fish |

1/ All fish were on deck for 1 hour before being stowed. Sea-water temperature, 74.7° F. - 75.6° F., averaging 75.3° F.
2/ Observations by a cannery representative.

acceptable with no trace of honeycombing, but the experimental groups gave varying results. There was no honeycombing in those held from 5 to 15 hours (6-16 hours from capture) in sea water, but the 20- and 25-hour groups (21-26 hours from capture) were all honeycombed. In the previous experiment fish held in seawater for 14 hours developed honeycombing, while in this instance the 15-hour group did not. The significant differences between the two experiments were: (1) the first experiment was conducted in August and the second in May; (2) the sea-water temperature averaged 78.4° F. in August and 75.3° F. in May; (3) the fish used were smaller in May; (4) the fleet was experiencing honeycombing in August but not in May. In view of these differences, the results appear to indicate that honeycombing is a seasonal phenomenon only in that it is related to seasonal changes in the sea-water temperature, and that it can probably be produced in Hawaiian skipjack at any season if the fish are kept at high enough temperatures for a long enough time.

EXPERIMENT NO. 4--Varying Time in Sea Water vs. Immediate Freezing: Following the same design as in the previous experiment, this trial used 90 fish averaging 28 pounds (25 to 34 pounds) each taken a few miles off the northwest coast of Oahu on June 9, 1955: 40 fish (Group A) were placed in the freezer within 1½ hours of capture; the remaining 50 fish were held in circulating sea water for varying lengths of time up to 25 hours (27 hours from capture). The sea-water temperature during the 25-hour interval ranged between 75.0° F. and 76.5° F., averaging 75.8° F.

The following observations were made at the time of transfer of fish from sea water to the freezer.

| Group | Hours In Sea Water | Remarks |
|---|---|---|
| B | 10 | Fish with slight off-odor but quite firm |
| C | 15 | Do. |
| D | 20 | Fish with ripe odor; meat somewhat softer |
| E | 25 | Fish with ripe odor; soft meat; deteriorating |

Unfortunately, as the ship's freezer was overcrowded, the fish did not freeze properly, and when they were delivered to the cannery's freezer on June 10, 28 hours after the start of the experiment, only a few of the control group were completely frozen. On June 14 the fish were removed from the cannery freezer to thaw. It was found at this time that four fish had lost their tags. These fish had been tied together in pairs with a single label, and since two groups of 10 were exactly two short, it was known that the four unlabeled fish had come from only two groups. By comparing the general condition of the two pairs of unidentified fish with the two groups, it was possible to make probable assignments. Pair X was in condition comparable to the remaining 8 fish of group C, and pair Y to group D (see table 5).

Table 5 - Results of Experiment No. 4

| Group | Number of Fish | Hours in Sea Water 1/ | Cannery Results | | Remarks 2/ |
|---|---|---|---|---|---|
| | | | Number Honeycombed | Percentage Honeycombed | |
| A | 40 | 0 | 0 | 0.0 | One fish with a "putty" texture |
| B | 10 | 5 | 1 | 10.0 | One fish with "very faint trace of what could be the start of honeycombing" |
| C<br>(X) | 8<br>2 (?) | 10<br>10 (?) | 1<br>1 | 20.0 | Two fish with "slight trace of what could be start of honeycombing" at nape--only at the surface |
| D<br>(Y) | 8<br>2 (?) | 15<br>15 (?) | 8<br>2 | 100.0 | All honeycombed; degree of honeycombing 5, 10, 10, 10, 20, 20, 20, 20, 20, and 50 percent, all at nape |
| E | 10 | 20 | 10 | 100.0 | All honeycombed; degree of honeycombing 20, 20, 20, 20, 25, 40, 40, 45, 45, and 80 percent. All at anterior portion of body, none in caudal region |
| F | 10 | 25 | 10 | 100.0 | All honeycombed; degree of honeycombing 10, 20, 40, 50, 55, 55, 55, 60, 80, and 95 percent. Only caudal region unaffected |

1/ All fish were on deck for 1 hours before being stowed. Sea-water temperature, 75.0° F.-76.5° F., averaging 75.8° F.
2/ Observations by a cannery representative.
(?) Indicates probable assignment of fish in the group as discussed in text.

Results and Discussion: There was a definite progression in the degree of honeycombing with the length of time the fish were kept in sea water (table 5).

Generally, the fish held in sea water for 15 hours or more were badly honeycombed; however, there were a few fish in the other groups which had possible traces of the condition. It may be relevant to reiterate here that in this experiment the fish did not freeze properly until they had been transferred to the cannery's freezer, 28 hours after the start of the experiment. This may have been the reason for the development of some honeycombing in the groups refrigerated after only 5 and 10 hours in sea water.

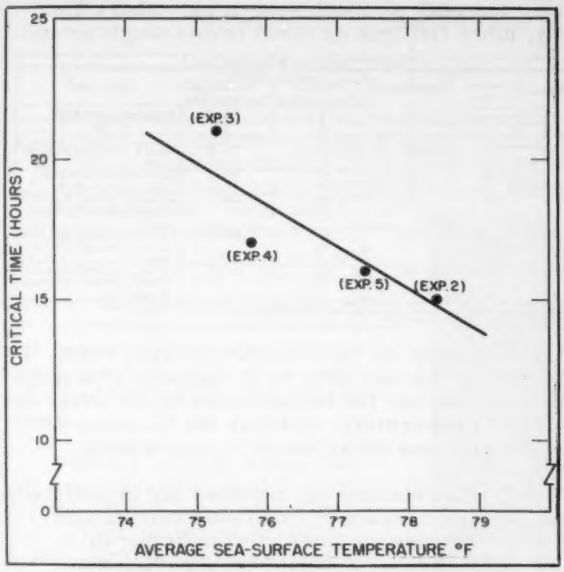


Fig. 4 - The relationship between average sea-water temperature and the length of time fish were held before honeycombing developed. (The sea-water temperature is the average surface temperature for the period in which the fish were held in sea water. Temperatures were obtained from bucket thermometer and thermograph readings. The "critical time," which is the time required to induce honeycombing in 90 percent of the fish, includes the time the fish were on deck prior to treatment.

Note: The critical time was not definitely established in experiment No. 2 since only one group of fish was held in sea water.)

This experiment, both in terms of results and design, closely resembled the preceding test, except that the fish were larger (28 pounds versus 7 pounds) and the sea water was slightly warmer. At the time of the experiment (June) the commercial fleet was not experiencing honeycombing.

EXPERIMENT NO. 5--Varying Time in Sea Water vs. Immediate Freezing: The final experiment in the series was conducted on 80 skipjack taken 19 miles off the west coast of Hawaii on August 17, 1955. These fish averaged $4\frac{1}{2}$ pounds in weight and ranged from about $3\frac{1}{2}$ to 5 pounds. The control group of 10 fish was frozen within 1 hour of capture and the remaining 70 were held in circulating sea water for lengths of time varying from 6 to 24 hours (7 to 25 hours from capture) and then frozen. The sea-water temperature in the brine well containing the fish ranged between 76.2° F. and 80.0° F., averaging 77.4° F. The 80 fish were delivered to the cannery's freezer on August 26, 1955, precooked on August 31, and examined on September 1.

Results and Discussion: The results (table 6) were essentially similar to those obtained in the previous experiments. Some honeycombing was evident in fish kept unrefrigerated for 13 hours, but the bulk of the honeycombing occurred in groups left unrefrigerated for 16 hours or longer. Here again the results clearly indicated a progression in the degree of honeycombing with the length of time the fish were held in unrefrigerated sea water.

## SUMMARY

The results of these experiments are remarkably consistent in showing that honeycombing develops in Hawaiian skipjack held without refrigeration, independent of sexual maturity or size of the fish. The seasonality of occurrence observed in the commercial landings (the condition is usually noticed during the summer) is not at all apparent in the experimental results, as honeycombing resulted from delayed refrigeration in experiments performed at different times of the year. It appears that the rate of honeycombing is more rapid at higher sea-water temperatures (fig. 4), and since the months of highest water temperatures in Hawaii coincide with the peak

skipjack season and peak "honeycombing season," it may be inferred that there is a close relationship between water temperature and honeycombing.

The relative fishing success during the peak skipjack season may also affect the onset of honeycombing. Generally, more fish can be taken from a single school during the peak than during the off-season. This may mean that larger numbers of fish are put into the bait well at one time, possibly causing an appreciable rise in the temperature of the sea water, because the body temperature of skipjack immediately after capture is generally higher than the water temperature (Uda 1941). Furthermore, it is believed that the skipjack undergoes an initial increase in temperature for several hours after landing, similar to that reported for the albacore (Scagel 1949). If, under these circumstances, the circulation in the bait well were impeded by a large quantity of fish, it would take considerable time for the temperature of the water in the well to revert to the normal sea-water temperature, and thus the tendency for honeycombing to develop in the warm summer sea water would be aggravated.

Table 6 - Results of Experiment No. 5

| Group | Number of Fish | Sea Water 1/ | Cannery Results | | Remarks 2/ |
|---|---|---|---|---|---|
| | | | Number Honeycombed | Percentage Honeycombed | |
| A | 10 | 9 | 0 | 0.0 | All in good condition |
| B | 10 | 6 | 0 | 0.0 | Do. |
| C | 10 | 9 | 0 | 0.0 | Do. |
| D | 10 | 12 | 3 | 30.0 | Slight traces on these three fish |
| E | 10 | 15 | 9 | 90.0 | Slight to minor on these fish--all at the nape |
| F | 10 | 18 | 10 | 100.0 | All honeycombed; degree of honeycombing 20-75 percent |
| G | 10 | 21 | 10 | 100.0 | All honeycombed; degree of honeycombing 95-100 percent |
| H | 10 | 24 | 10 | 100.0 | All honeycombed; degree of honeycombing 100 percent in each fish |

1/ All fish were on deck 1 hour before being stowed. Sea-water temperature, 78.5° F.-80.0° F., averaging 77.4° F.
2/ Observations by a cannery representative.

Although it has been shown that there is a relationship between lag in refrigeration and honeycombing, the basic cause of the condition has not been determined. Further experiments are necessary before precise methods of eliminating or reducing the condition can be prescribed. The results of these few experiments, however, do suggest that in Hawaii a modest amount of refrigeration on the boats would postpone the development of honeycombing long enough to permit delivery of the fish in good condition to the canneries' chill tanks. It might suffice to handle the catch in crushed ice, or simply to add a little ice to the sea water in which the fish are held aboard the boats.

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# SHRIMP EXPLORATIONS OFF THE WASHINGTON COAST, FALL 1955 AND SPRING 1956

By Edward A. Schaefers* and Harold C. Johnson*


## SUMMARY

Shrimp explorations off the Washington coast were conducted by the Service's exploratory fishing vessel John N. Cobb during the fall (October 18 to November 9) of 1955 and spring (March 27 to April 19) of 1956. These explorations were carried out in cooperation with the State of Washington Department of Fisheries' shellfish division. Gear used during the fall exploration included a 20-foot beam trawl and a small West Coast box-type otter trawl. Gear used during the spring exploration included a 20-foot beam trawl, a small West Coast box-type otter trawl, and a 40-foot Gulf of Mexico shrimp trawl.

Fishing results during the fall exploration showed that pink shrimp (Pandalus jordani) were widely distributed at various depths over the entire area explored. The best drag with the beam trawl caught 150 pounds of heads on shrimp an hour and the best drag with the otter trawl caught 600 pounds of shrimp an hour.

Fig. 1 - Method of attaching port door to wing of Gulf shrimp trawl. Starboard door was attached in same manner. Arrow indicates forward portion of "lazy line."


Fishing results during the spring exploration showed that of the three types of gear used, the Gulf shrimp trawl was the most efficient and practicable type of gear for catching shrimp on these grounds. Of the 51 drags made with this gear, 25 caught shrimp in amounts ranging from 300 to 2,200 pounds an hour. The two most promising localities which appeared to offer the best prospects for the development of a commercial shrimp fishery are between the mouth of the Moclips River and the mouth of Connor Creek, and between Grays Harbor and Cape Shoalwater.


## BACKGROUND

Explorations for shrimp off the Washington coast were undertaken by the U. S. Fish and Wildlife Service's exploratory fishing vessel John N. Cobb during the fall of 1955 and the spring of 1956. These explorations were carried out in cooperation with the State of Washington Department of Fisheries' shellfish division whose personnel participated in the collection of data aboard the vessel and examined samples of shrimp in the laboratory after the completion of each trip.

During the fall exploration (October 18 to November 9, 1955), 45 drags were made with a 20-foot beam trawl and 7 drags were made with a small West Coast

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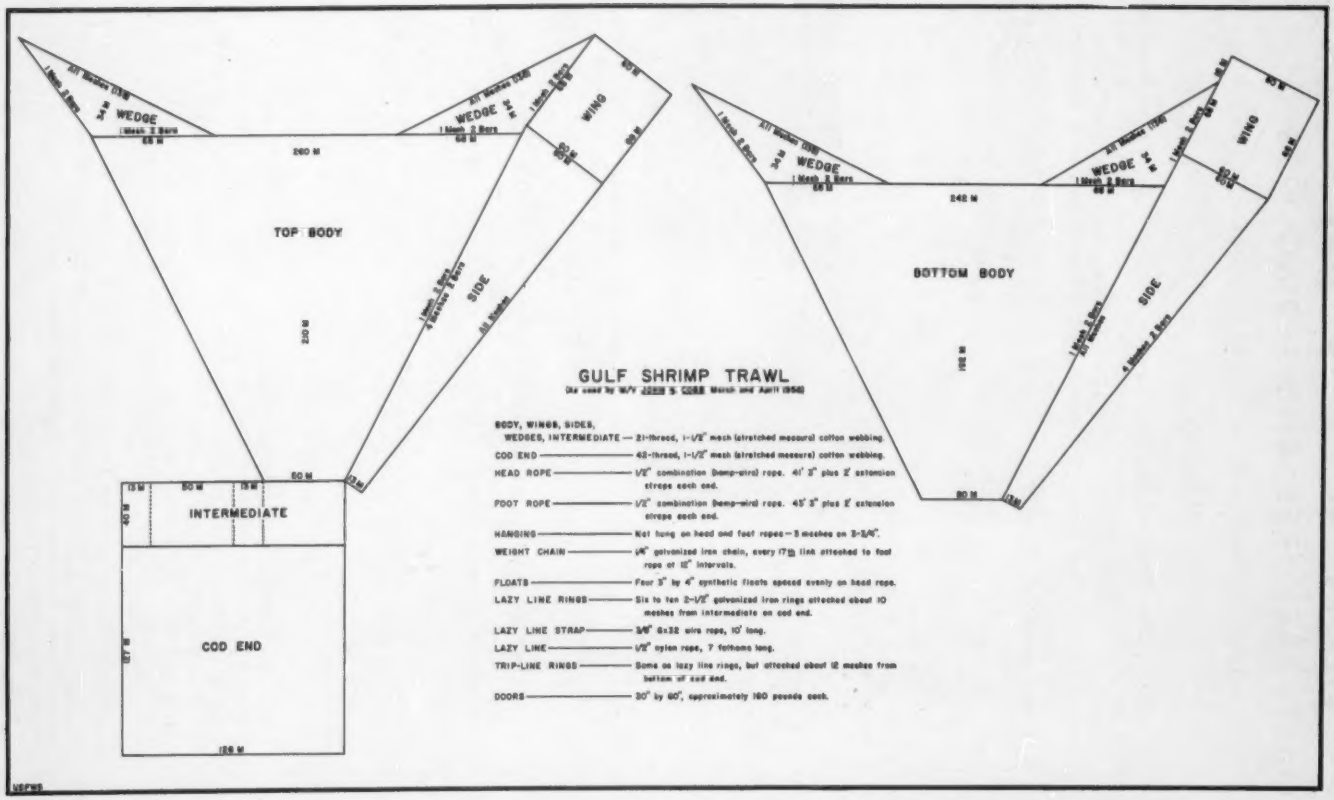
WEDGE
WEDGE
WING
TOP BODY
SIDE
INTERMEDIATE
COD END
BOTTOM BODY
SIDE
WING
WEDGE
WEDGE
GULF SHRIMP TRAWL
BODY, WINGS, SIDES, WEDGES, INTERMEDIATE — 21-thread, 1-1/2" mesh (stretched measure) cotton webbing.
COD END — 42-thread, 1-1/2" mesh (stretched measure) cotton webbing.
HEAD ROPE — 1/2" combination (hemp-wire) rope. 41' 3" plus 2' extension straps each end.
FOOT ROPE — 1/2" combination (hemp-wire) rope. 45' 3" plus 2' extension straps each end.
HANGING — Net hung on head and foot ropes — 5 meshes on 2-3/4".
WEIGHT CHAIN — 1/4" galvanized iron chain, every 17th link attached to foot rope at 12" intervals.
FLOATS — Four 3" by 4" synthetic floats spaced evenly on head rope.
LAZY LINE RINGS — Six to ten 2-1/2" galvanized iron rings attached about 10 meshes from intermediate on cod end.
LAZY LINE STRAP — 3/8" 6x32 wire rope, 10' long.
LAZY LINE — 1/2" nylon rope, 7 fathoms long.
TRIP-LINE RINGS — Same as lazy line rings, but attached about 12 meshes from bottom of cod end.
DOORS — 30" by 60", approximately 180 pounds each.

Fig. 2 - Gulf shrimp trawl used during the spring (March 27 to April 19, 1956) exploration by the exploratory fishing vessel John N. Cobb.

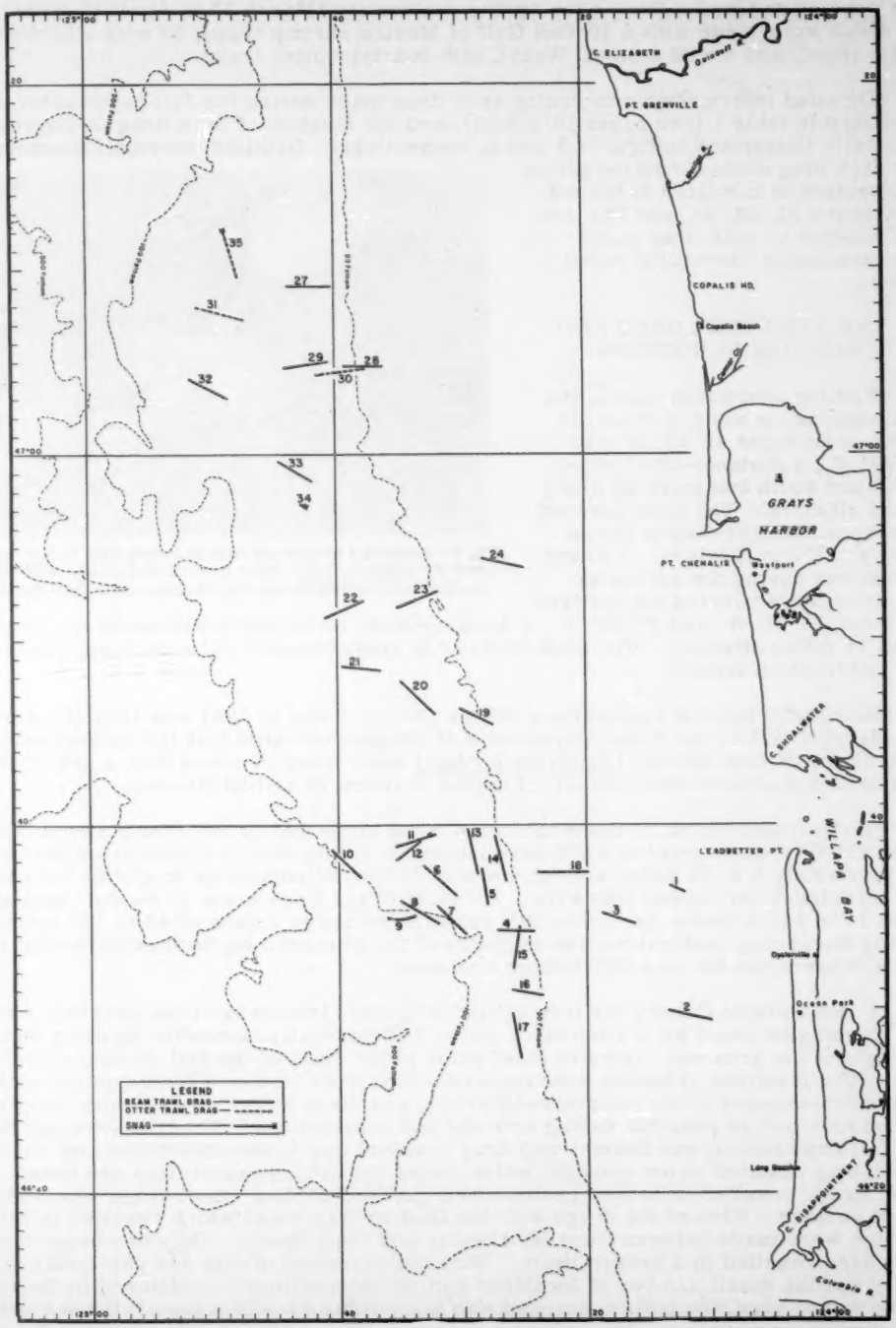


Fig. 3 - Location of beam-trawl drags and otter-trawl drags between Ocean Park and Cape Elizabeth, fall (October 18 to November 9, 1955) exploration.

box-type otter trawl. During the spring exploration (March 27 to April 19, 1956), 51 drags were made with a 40-foot Gulf of Mexico shrimp trawl, 39 with a 20-foot beam trawl, and 4 with a small West Coast box-type otter trawl.

Detailed information concerning each drag made during the fall exploration is tabulated in table 1 (see pages 19 and 20), and the location of each drag is diagrammatically illustrated in figures 3 and 4, respectively. Detailed information concerning each drag made during the spring exploration is tabulated in table 2 (see pages 21, 22, 23, and 24), and the location of each drag is diagrammatically illustrated in figure 8.

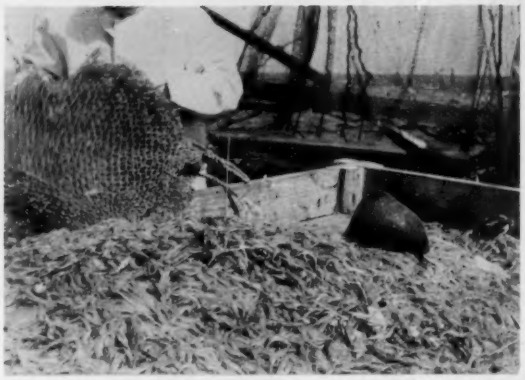

Fig. 4 - Emptying a beam-trawl catch on sorting table located on the deck of the John N. Cobb. Beam-trawl catches usually contained few fish requiring little time or effort to separate fish from shrimp.

## THE AREA EXPLORED AND BOTTOM CONDITIONS

Fishing operations during the fall exploration were carried out between latitudes 46°27' N. and 48°04' N., a distance of 97 miles north and south and from $4\frac{1}{2}$ to $28\frac{1}{2}$ miles offshore. The area covered is approximately between Ocean Park and Carroll Island. Fishing operations during the spring exploration were carried out between latitudes 46°21' N. and 47°42' N., a distance of 81 miles north and south and from 11 to 31 miles offshore. The area covered is approximately between Long Beach and Destruction Island.

Successful shrimp explorations off the Oregon coast in 1951 and 1952 (Pruter and Harry 1952) by the Fish Commission of Oregon indicated that the largest concentrations of pink shrimp (Pandalus jordani) were taken in areas with a green-mud or a mixed mud-and-sand bottom, at depths between 60 and 80 fathoms.

Navigational charts of the Washington coast show that in the area between Ocean Park and Carroll Island the width between the 50- to 100-fathom contours varies from approximately 3 to 15 miles with green-mud bottom at numerous localities between these contours throughout this area. Although drags were made at depths ranging from 21 to 116 fathoms during the fall exploration and at depths of 48 to 139 fathoms during the spring exploration, the majority of the drags during both explorations were made between the 50- and 100-fathom contours.

A commercial fishery for bottom fish with otter trawls has been carried on off the Washington coast for a number of years, and generally favorable trawling bottom throughout the area was known to exist prior to the start of the fall shrimp exploration. The locations of known bottom obstructions were obtained from commercial fishermen engaged in the otter-trawl fishery, and these known obstructions were avoided as much as possible during both shrimp explorations. Nevertheless, during the fall exploration, one beam-trawl drag resulted in a broken beam and one otter-trawl drag resulted in net damage, while during the spring exploration two beam-trawl drags resulted in broken beams and eight Gulf shrimp-trawl drags resulted in net damage. Five of the drags with the Gulf shrimp trawl which resulted in net damage were made between Cape Shoalwater and Long Beach. Only one beam-trawl drag here resulted in a broken beam. With the exception of this one particular locality and the small number of localized bottom obstructions encountered in the rest of the entire area, the bottom dragged was considered excellent for all three types of gear.

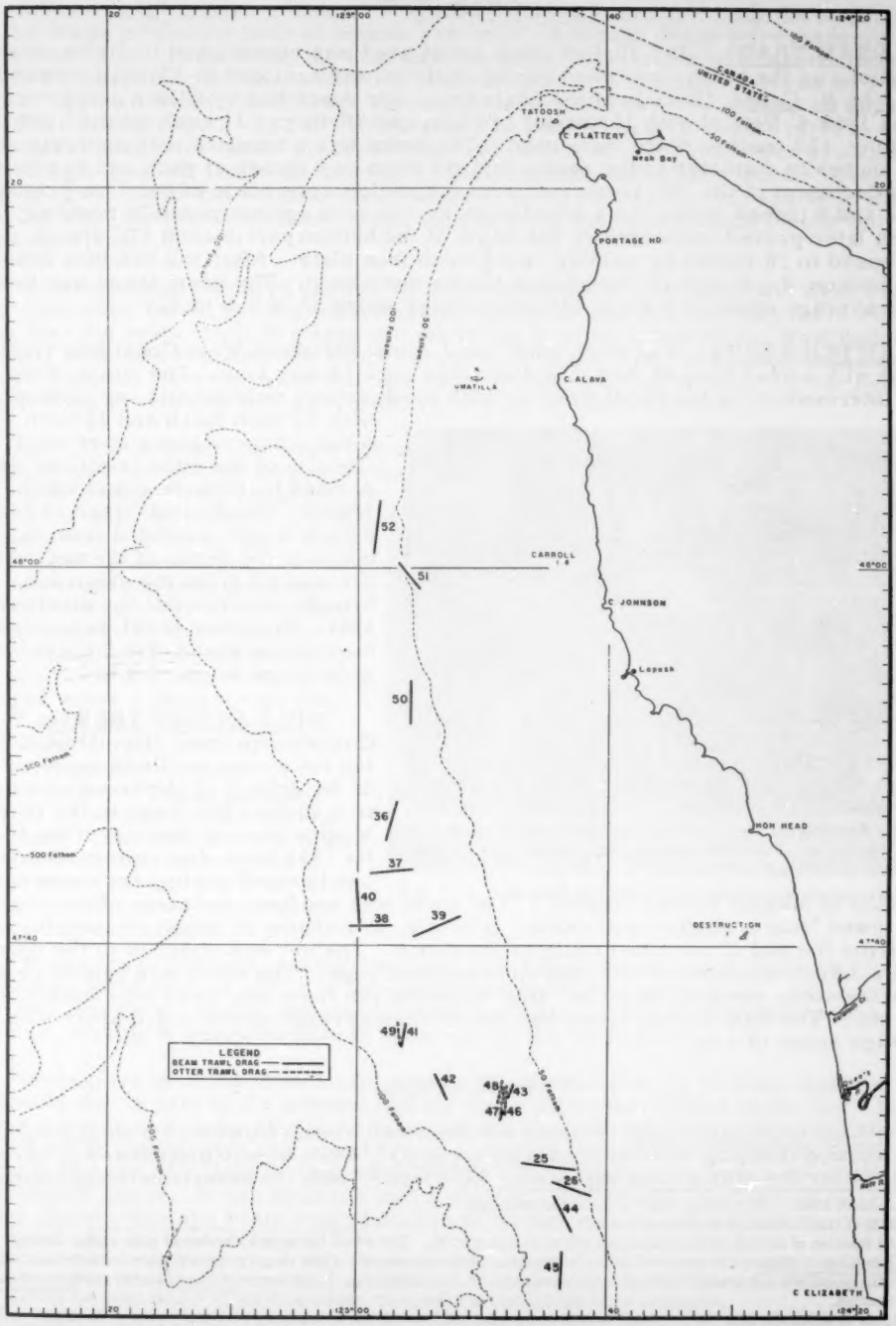


Fig. 5 - Location of beam-trawl drags and otter-trawl drags between Cape Elizabeth and Carroll Island, fall (October 18 to November 9, 1955) exploration

## GEAR USED

BEAM TRAWL: The 20-foot beam trawl used was constructed to the same specifications as the beam trawl used during shellfish explorations in Alaskan waters by the John N. Cobb. (Details of the beam trawl are described by Ellson and Livingstone 1952.) Nets of both 15-thread $1\frac{1}{4}$-inch, and 36-thread $1\frac{1}{2}$-inch mesh[1/] cotton webbing, 150 meshes deep, were used. The beam was a hemlock pole approximately 8 inches in diameter at the center and cut down to 6 inches at each end to allow for attachment of the "D" frames or runners, which were made of bar iron $\frac{5}{8}$-inch thick and 6 inches wide. As a precautionary measure against possible mudding, which later proved unnecessary, the width of the bottom part of each "D" frame was increased to 16 inches by welding on a $\frac{5}{8}$-inch iron plate. After the hemlock beam was broken, 6 x 6-inch milled spruce beams were used. The beam trawl was towed at an average speed of 2 knots with an average scope[2/] of 2.8 to 1.

OTTER TRAWL: The otter trawl used was a 600-mesh West Coast box-type trawl with a head rope 45 feet long and a foot rope 54 feet long. The wings, body, and intermediate of the trawl were $1\frac{1}{2}$-inch mesh cottom webbing and cod ends of both $1\frac{1}{4}$-inch mesh and $1\frac{1}{2}$-inch mesh cotton webbing were used. (Details of the otter trawl are described by Schaefers and Smith 1954.) "Dandy-line" gear 13 fathoms in length extended from the doors to the wings of the net. The net was set from the stern and brought aboard over the starboard side. The otter trawl was towed at an average speed of 2.7 knots with an average scope of 3 to 1.

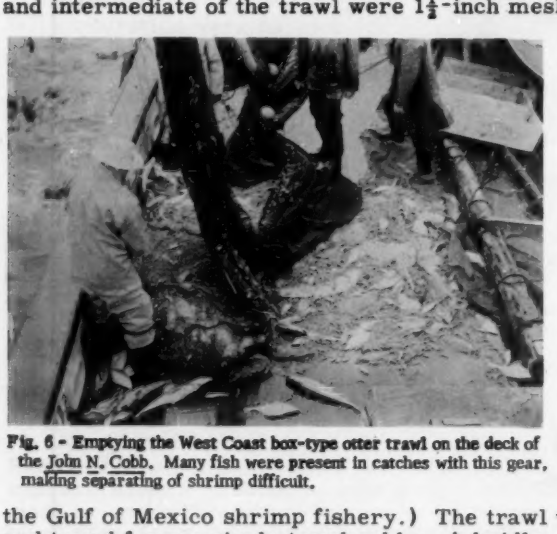

Fig. 6 - Emptying the West Coast box-type otter trawl on the deck of the John N. Cobb. Many fish were present in catches with this gear, making separating of shrimp difficult.

GULF SHRIMP TRAWL: The Gulf shrimp trawl (fig. 1) used during the spring shellfish exploration of the John N. Cobb is referred to as a 40-foot flat trawl in the Gulf of Mexico shrimp fishery. (See Bullis 1951 for a description of various types of shrimp trawls used in the Gulf of Mexico shrimp fishery.) The trawl was set from the stern of the vessel and towed from a single trawl cable. A bridle, 25 fathoms in length on each leg, led from the end of the trawl cable to the doors. The net was attached to the doors with a 2-foot extension of the head rope and foot rope. The catch was hauled aboard over the stern using a "lazy line" (fig. 2) which ran from one trawl door back to the cod end. The Gulf shrimp trawl was towed at an average speed of 2.6 knots with an average scope of 3 to 1.

## FISHING RESULTS

FALL EXPLORATION: Fishing results with the beam trawl during the fall exploration showed that pink shrimp (Pandalus jordani)[3/] were widely distributed at various depths over the entire area explored. All drags[4/] with the beam trawl caught shrimp

1/ All mesh sizes in this report refer to stretched measure.

2/ Ratio of trawl cable out to depth of water.

3/ Any mention of shrimp in the discussion refers to this species. The small infrequent catches of side-stripe shrimp (Pandalopsis dispar) are tabulated in the fishing log. Other species of shrimp were frequently taken but only in insignificant quantities and are not included in the discussion or the fishing log. These were Crangon species and Spirontocaris species.

4/ Drags in which the gear did not reach bottom are not included.

in amounts ranging from a "trace" [5] to 150 pounds per hour, [6] with the majority of the drags producing over 40 pounds per hour. Although drags were made at depths of 21 to 116 fathoms, the best catches were made at depths of approximately 40 to 90 fathoms on bottom consisting of green mud or a mixture of green mud and sand. Of the 9 beam-trawl drags that caught over 100 pounds of shrimp an hour, 7 were made at depths of 51 to 71 fathoms, and 2 were made at depths of 78 to 88 fathoms. Localities which produced over 100 pounds of shrimp an hour are located off Willapa Bay, off Grays Harbor, off Cape Elizabeth, and off the Queets River. For the best beam-trawl catches see drags 5, 20-23, 27, 32, 41-43, and 45 in the fishing log. Shrimp from these drags ranged from 115 to 166 whole (heads-on) shrimp a pound. [7]

Although only a limited number of drags were made with the small West Coast box-type otter trawl, results indicated that this gear was considerably more effective than the beam trawl in taking shrimp in the area explored off the Washington coast. This was probably due to the larger size of the otter trawl and the faster speed at which the otter trawl was normally towed resulting in more bottom being fished than when using the beam trawl for a similar period of time.

Off Copalis Head four beam-trawl drags at depths of 44 to 81 fathoms caught from 55 to 95 pounds of shrimp an hour and 3 otter-trawl drags at depths of 48 to 80 fathoms caught from 240 to 600 pounds of shrimp an hour. Off the Queets River, a beam-trawl drag at 61 to 65 fathoms that caught 120 pounds of shrimp an hour was approximately duplicated by an otter-trawl drag at 61 to 63 fathoms which caught 270 pounds of shrimp an hour. In this same locality in deeper water a beam-trawl drag at 77 to 88 fathoms caught 110 pounds of shrimp an hour while an approximate duplicate otter-trawl drag at 81 to 85 fathoms caught 50 pounds of pink shrimp an hour. This was the only drag in which the otter trawl failed to catch more shrimp per hour than the best beam-trawl drag of the entire fall exploration.

Fig. 7 - A clean catch of shrimp taken with the Gulf shrimp trawl.

Beam-trawl catches usually contained only small quantities of incidental fish, requiring little time or effort in separating the fish from the shrimp. Otter-trawl catches, however, usually contained larger quantities of fish [8] in relation to the shrimp, making it impracticable to separate all the shrimp.

Shrimp taken in the otter trawl appeared to be smashed in varying degrees, probably due in part to the pressure of the fish against them while in the net. For these reasons it was decided that the use of the small otter trawl for catching shrimp would not be practicable in a commercial operation, and it was decided to experiment in the use of a Gulf shrimp trawl during future shrimp explorations off the Washington coast. It was believed that a 40-foot Gulf shrimp trawl would catch more shrimp than the beam trawl because of its increased spread and faster towing

5/ "Trace" - less than one pound of shrimp.

6/ During the fall exploration all drags in which the gear reached the bottom were of 1-hour duration with the exception of drags number 1 and 34 which were beam-trawl drags and drags number 48 and 49 which were otter-trawl drags. The catches for drags number 48 and 49 have been converted to an hourly basis in the discussion.

7/ For details of number of whole shrimp per pound for various drags see tables 1 and 2.

8/ Data concerning fish taken along with the shrimp have been turned over to the State of Washington Department of Fisheries shellfish division for processing.

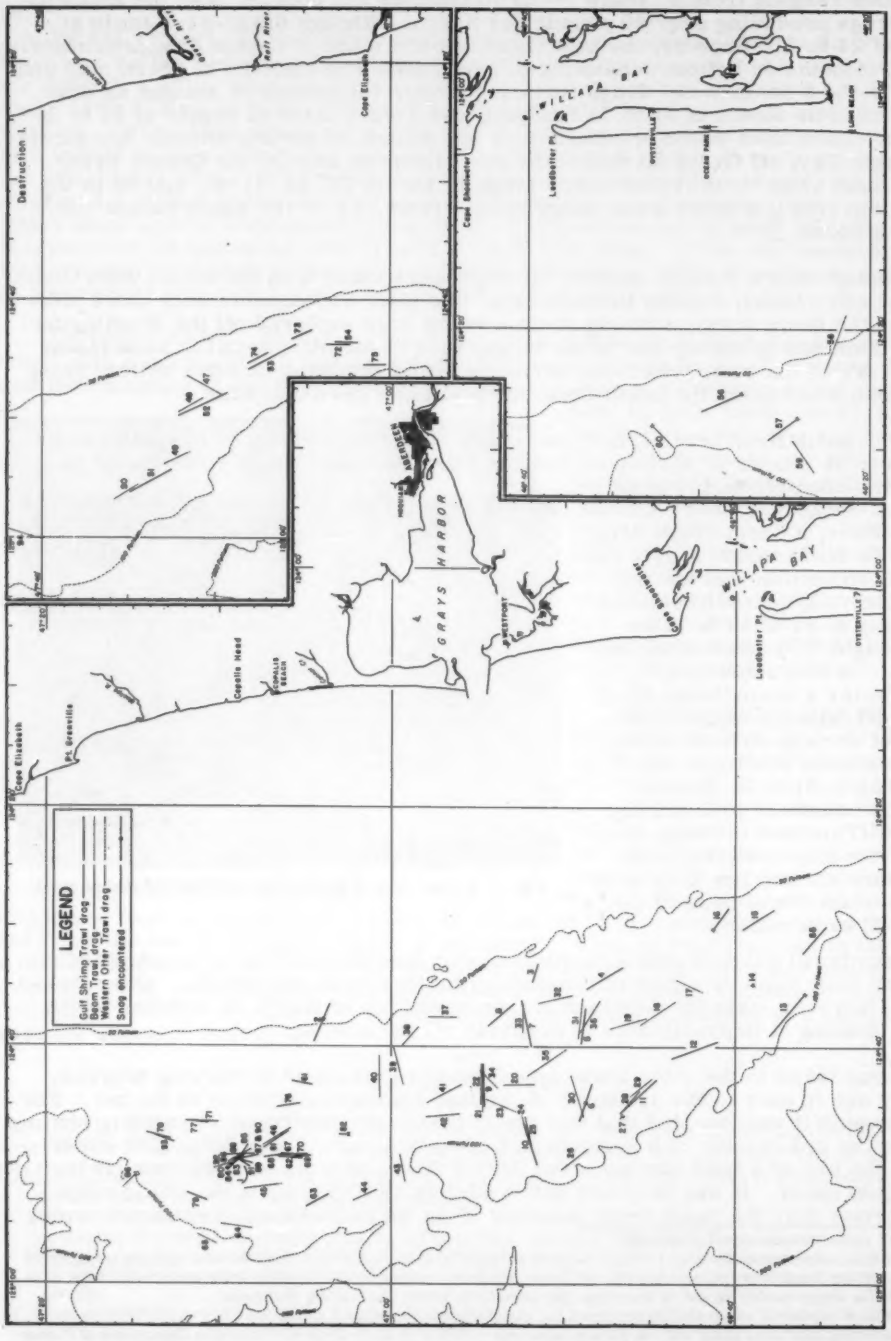


Fig. 8 - Location of beam-trawl drags, otter-trawl drags, and Gulf shrimp-trawl drags, spring exploration (March 27 to April 19, 1956).

speed resulting in more bottom being fished per hour. It was also believed that the 40-foot Gulf shrimp trawl would catch less fish than the West Coast box-type otter trawl because of its shorter wings, less overhang, and the method of attaching the doors almost directly to the net rather than having "dandy-line" gear leading from the doors to the net as in the case of the West Coast otter trawl. These beliefs proved to be true during the spring shrimp exploration.

SPRING EXPLORATION: The best shrimp catches during the spring exploration were made with the Gulf shrimp trawl. Of the 51 drags made with this gear, 25 caught shrimp in amounts ranging from 300 to 2,200 pounds an hour.9/

These 25 drags were made in the area between the mouth of Queets River and Oysterville at depths ranging from 61 to 87 fathoms. The two most promising localities which appeared to offer the best prospects for the development of a commercial shrimp fishery are between the mouth of the Moclips River and the mouth of Conner Creek, and between Grays Harbor and Cape Shoalwater.

Between the mouth of the Moclips River and the mouth of Connor Creek a total of 21 daytime and 4 nighttime drags were made with the Gulf shrimp trawl. Excellent shrimp catches were made during daytime hours in 15 of 16 drags at depths of 69 to 79 fathoms. With the exception of drag No. 1 which caught 175 pounds of shrimp, the other 15 drags at these depths caught from 980 to 2,200 pounds of shrimp an hour and averaged 1,407 pounds of shrimp an hour. Included in these 15 drags which were all made on green mud bottom were a series of 7 "production" drags (Nos. 85-91), each of 30-minutes duration made over a 6-hour period between 6:00 a.m. and 12 noon on April 18. These 7 drags, at depths of 74 to 79 fathoms, produced a total of 5,210 pounds of shrimp, with an average of 744 pounds of shrimp per 30-minute drag. The shrimp from these "production" drags averaged from 117 to 148 whole (heads on) shrimp a pound.

The remaining 5 daytime drags with the Gulf shrimp trawl in this locality at various depths from 48 to 66 fathoms and from 83 to 86 fathoms caught from a trace to 250 pounds of shrimp an hour.

Drags with the beam trawl in this locality at depths of 73 to 81 fathoms caught from 90 to 200 pounds of shrimp an hour and drags at over 90 fathoms caught insignificant quantities of shrimp.

The four nighttime drags, all made with the Gulf shrimp trawl, were approximate duplicates of daytime drags which had produced excellent catches of shrimp. The nighttime drags, however, produced only insignificant catches of shrimp ranging from 8 to 14 pounds of shrimp an hour. These drags, each of 30 minutes duration, were started from $1\frac{1}{2}$ to 4 hours after sunset. Results of these nighttime drags suggest that shrimp trawling may not be productive during certain hours of darkness in this area during this season of the year.

Evidence that individuals of this species of shrimp do come off the bottom at night was subsequently obtained in early June 1956, off the northern end of Vancouver Island during a midwater trawl expedition for fish by the John N. Cobb. A drag with a midwater trawl at depths of $43\frac{1}{2}$ to 50 fathoms over bottom depths of 109 to 121 fathoms caught 186 individual pink shrimp. This drag, of 1-hour duration was started $4\frac{3}{4}$ hours after sunset. With the exception of a small-mesh liner in the cod end, the mesh size of the rest of this midwater trawl was too large to effectively capture shrimp, and more shrimp would probably have been taken if the entire net were of a small-mesh size.

9/ Catch results have been converted to a rate-per-hour basis as some variation occurred in the duration of a considerable number of individual drags during the spring exploration.

The one nighttime beam-trawl drag made during the fall exploration caught 65 pounds of shrimp an hour. This drag was started 2½ hours after sunset and was not a duplicate of a daytime drag.

Between the entrance of Grays Harbor and Cape Shoalwater a total of 28 drags were made at depths of 54 to 93 fathoms. Of these 28 drags, 16 were made with the beam trawl, 9 with the Gulf shrimp trawl, and 3 with the western otter trawl. Except for 1 drag at 54 to 56 fathoms which caught only 6 pounds of shrimp an hour and another which snagged, the other 7 drags with the Gulf shrimp trawl caught from 230 to 700 pounds of shrimp an hour. These 7 drags were made at depths of 57 to 87 fathoms. The best drag was made on a green mud bottom while the remaining drags were on a bottom composed of green mud and sand.

Of the 16 beam-trawl drags, 1 resulted in a broken beam, 8 caught from 120 to 275 pounds of shrimp an hour, and the remainder caught from 3 to 90 pounds of shrimp an hour. The majority of the beam-trawl drags which caught over 120 pounds of shrimp an hour were made in approximately the same locations as some of the better Gulf shrimp-trawl drags. The 3 otter-trawl drags caught from 150 to 600 pounds of shrimp an hour. The sizes here ranged from 109 to 182 whole (heads-on) shrimp a pound

Commercial quantities of shrimp were also taken with the Gulf shrimp trawl between Cape Elizabeth and Kalaloch Creek at depths ranging from 57 to 83 fathoms. The majority of the drags with this gear in this locality caught from 420 to 720 pounds of shrimp an hour with only 1 drag [10/] producing less than 420 pounds of shrimp an hour. Drags with the beam trawl caught from 140 to 250 pounds of shrimp an hour.

While drags in this locality produced commercial quantities of shrimp, the shrimp were consistently small, averaging from 161 to 214 whole (heads-on) shrimp a pound. These small shrimp may be present only at certain seasons of the year, as shrimp taken from drags in this locality during the fall exploration showed a marked variation in size running from 100 to 166 whole (heads-on) shrimp a pound.

Between Cape Shoalwater and Long Beach 8 drags were made with the Gulf shrimp trawl at depths of 54 to 105 fathoms, with only 1 drag resulting in a catch of over 300 pounds an hour. This drag (No. 55), of 1-hour duration, was made at 75 to 80 fathoms and caught 315 pounds of shrimp. Five of these drags encountered snags which resulted in torn web. Beam-trawl drags in this area caught only small amounts of shrimp and 1 drag resulted in a broken beam.

## SHRIMP ICING EXPERIMENTS

Shrimp were held on ice during the spring exploration for as long as 96 hours with little change noted in the texture of the shrimp meat before or after cooking. The cooked shrimp meat was equal in flavor and color to that of shrimp cooked soon after being landed. It was noted, however, that after 48 hours on ice the pink color of the whole shrimp appeared to have faded to a paler shade. After a day on ice, the shrimp were much easier to peel than when first caught.

## WEATHER CONDITIONS

Fishing operations during the fall exploration were seriously curtailed by adverse weather conditions, with no trawling possible on 9 of the 23 days the vessel was in the area of fishing operations.

Weather conditions were generally favorable for fishing operations during the spring exploration with trawling possible on all but 5 of the 24 days the vessel was in the area of fishing operations.

10/ Drag Nos. 53 and 54 are not included. These drags, made during adverse weather conditions, captured only trace amounts of shrimp and were approximately duplicated by drags No. 74 and 72, respectively, which caught 720 and 420 pounds of shrimp an hour.

Table 1 - Fishing Log--Shrimp Exploration Off The Washington Coast--Fall 1955--John N. Cobb

| Drag number | 1 (S.T.) [1] | 2 (S.T.) | 3 (S.T.) | 4 (S.T.) | 5 (S.T.) | 6 (S.T.) | 7 (S.T.) | 8 (S.T.) | 9 (S.T.) | 10 (S.T.) | 11 (S.T.) | 12 (S.T.) | 13 (S.T.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | 10/18/55 | 10/19/55 | 10/19/55 | 10/19/55 | 10/19/55 | 10/19/55 | 10/20/55 | 10/20/55 | 10/20/55 | 10/20/55 | 10/20/55 | 10/20/55 | 10/21/55 |
| Latitude N. | 46°36.3' | 46°29.5' | 46°31.7' | 46°34.2' | 46°35.6' | 46°37.8' | 46°31.1' | 46°34.7' | 46°35.1' | 46°37.2' | 46°38.8' | 46°39.6' | 46°37.3' |
| Longitude W. | 124°12.1' | 124°10.0' | 124°16.2' | 124°24.2' | 124°28.0' | 124°33.2' | 124°29.7' | 124°32.0' | 124°33.9' | 124°38.2' | 124°35.4' | 124°32.5' | 124°28.8' |
| Loran reading | 2H4-3800 | 2H4-3715 | 2H4-3779 | 2H4-3770 | 2H4-3784 | 2H4-3836 | 2H4-3763 | 2H4-3769 | 2H4-3772 | 2H4-3792 | 2H4-3816 | 2H4-3827 | 2H4-3805 |
| Loran reading | 2H5-3489 | 2H5-3487 | 2H5-3479.5 | 2H5-3460 | 2H5-3451 | 2H5-3437 | 2H5-3448 | 2H5-3439 | 2H5-3433 | 2H5-3420 | 2H5-3430 | 2H5-3440 | 2H5-3460 |
| Course, magnetic [2] | 272° | 262° | 264° | 250° | 329° | 110° | 291° | 278° | 248° | 290° | 051° | 211° | 325° |
| Sea | Smooth | Smooth | Smooth | Slight | Slight | Slight | Slight | Slight | Smooth | Slight | Slight | Slight | Calm |
| Depth range in fathoms | 25-28 | 21-28 | 34-39 | 50-69 | 62-65 | 71-74 | 81-84 | 89-91 | 100-116 | 89-93 | 68-76 | 69-77 | 57-61 |
| Type of bottom | gy. S. | gy. S. | gn. M. & S. | gn. M. & S. | gn. M. & S. | gn.-gy.M. & S. | gn. M. & S. | gn. M. & S. | gn. M. & S. | gn. M. & S. | - | gn. M. & S. | gn. M. & S. |
| Trawling bottom | Clear | Clear | Clear | Clear | Clear | Clear | Clear | Clear | Clear | Clear | - | Clear | Clear |
| Time on bottom in minutes | 30 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | - | 60 | 60 |
| Shrimp catch in pounds: (whole shrimp per pound) [3] | | | | | | | | | | | | | |
| Pink | Trace [4] | Trace | 14 (117) | 35 (140) | 130 (127) | 18 (134) | 75 (164) | 80 (119) | 40 (121) | 30 (119) | - | 45 (148) | 75 (119) |
| Side-stripe | - | - | - | - | - | - | 1 (78) | 2 (73) | 2 (73) | - | - | - | - |
| Total shrimp catch in pounds | - | - | 14 | 35 | 130 | 18 | 76 | 82 | 42 | 30 | - | 45 | 75 |
| Remarks | - | - | - | - | - | - | - | - | - | - | Net not on bottom | - | - |

| Drag number | 14 (S.T.) [1] | 15 (S.T.) | 16 (S.T.) | 17 (S.T.) | 18 (S.T.) | 19 (S.T.) | 20 (S.T.) | 21 (S.T.) | 22 (S.T.) | 23 (S.T.) | 24 (S.T.) | 25 (S.T.) | 26 (S.T.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | 10/21/55 | 10/21/55 | 10/21/55 | 10/21/55 | 10/21/55 | 10/22/55 | 10/22/55 | 10/22/55 | 10/22/55 | 10/22/55 | 10/23/55 | 10/23/55 | 10/23/55 |
| Latitude N. | 46°39.4' | 46°34.5' | 46°30.8' | 46°29.7' | 46°37.4' | 46°46.4' | 46°46.0' | 46°48.4' | 46°51.2' | 46°51.8' | 46°53.9' | 47°28.1' | 47°24.7' |
| Longitude W. | 124°27.4' | 124°25.5' | 124°23.6 | 124°26.0' | 124°20.0' | 124°27.5' | 124°32.2' | 124°36.5' | 124°41.0 | 124°35.1' | 124°24.9' | 124°18.5' | 124°41.2' |
| Loran reading | 2H4-3931 | 2H4-3772 | 2H4-3728 | 2H4-3714 | 2H4-3812 | 2H4-3905 | 2H4-3907 | 2H4-3928 | 2H4-3952 | 2H4-3970 | 2H4-4011 | 2H4-4053 | 2H4-4053 |
| Loran reading | 2H5-3465 | 2H5-3457 | 2H5-3469 | 2H5-3452 | 2H5-3473 | 2H5-3469 | 2H5-3444 | 2H5-3459 | 2H5-3411 | 2H5-3435 | 2H5-3473 | 2H5-3286 | 2H5-3305 |
| Course, magnetic [2] | 118° | 167° | 298° | 178° | 248° | 279° | 291° | 254° | 044° | 047° | 299° | 254° | 266° |
| Sea | Smooth | Smooth | Smooth | Smooth | Smooth | Slight | Slight | Slight | Slight | Slight | Slight | Slight | Slight |
| Depth range in fathoms | 52-53 | 55-61 | 49-64 | 58-60 | 41-47 | 48-52 | 57-61 | 65-71 | 62-69 | 51-56 | 34-43 | 53-63 | 50-56 |
| Type of bottom | br.-gn.M.& S. | gn.M.S.& Sh. | gn. M. & S. | gn. M. & S. | gn. M. & S. | gn. M. & S. | gn. M. & S. | gn. M. & S. | gn. M. & S. | gn. M. & S. | - | gn. S. | gn. M. & S. |
| Trawling bottom | Clear | Clear | Clear | Clear | Clear | Clear | Clear | Clear | Clear | Clear | - | Clear | Clear |
| Time on bottom in minutes | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | - | 60 | 60 |
| Shrimp catch in pounds: (whole shrimp per pound) [3] | | | | | | | | | | | | | |
| Pink | 40 (115) | 65 (139) | 18 (126) | 30 (134) | 70 (125) | 75 (150) | 110 (158) | 140 (145) | 130 (148) | 110 (161) | - | 40 (121) | 70 (107) |
| Side-stripe | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total shrimp catch in pounds | 40 | 65 | 18 | 30 | 70 | 75 | 110 | 140 | 130 | 110 | - | 40 | 70 |
| Remarks | - | - | - | - | - | - | - | - | - | - | Net not on bottom | - | - |

Note: For explanation of footnotes and abbreviations, see p. 20.

Table 1 - Fishing Log--Shrimp Exploration Off The Washington Coast--Fall 1955--John N. Cobb (Contd.)

| Drag number | 27 (B.T.) 1/ | 28 (B.T.) | 29 (B.T.) | 30 (O.T.) | 31 (O.T.) | 32 (B.T.) | 33 2/ (B.T.) | 34 (B.T.) | 35 (O.T.) | 36 (B.T.) | 37 (B.T.) | 38 (B.T.) | 39 (B.T.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | 10/31/55 | 11/1/55 | 11/1/55 | 11/1/55 | 11/1/55 | 11/1/55 | 11/1/55 | 11/5/55 | 11/5/55 | 11/6/55 | 11/6/55 | 11/6/55 | 11/6/55 |
| Latitude N. | 47°09.1' | 47°04.6' | 47°05.1' | 47°04.7' | 47°07.3' | 47°03.1' | 46°58.6' | 46°57.3' | 47°09.7' | 47°47.8' | 47°44.1' | 47°41.0' | 47°40.5' |
| Longitude W. | 124°40.3' | 124°36.2' | 124°40.6' | 124°37.6' | 124°47.3' | 124°48.7' | 124°41.9' | 124°42.9' | 124°47.8' | 124°56.8' | 124°55.7' | 125°00.6' | 124°55.5' |
| Loran reading | 28h-4145 | 28h-4115 | 28h-4105 | 28h-4110 | 28h-4103 | 28h-4098 | 28h-4033 | 28h-4017 | 28h-4122 | 28h-4253 | 28h-4250 | 28h-4229 | 28h-4263 |
| Loran reading | 28S-3400 | 28S-3408 | 28S-3405 | 28S-3421 | 28S-3362 | 28S-3363 | 28S-3424 | 28S-3400 | 28S-3353 | 28S-3089 | 28S-3070 | 28S-3070 | 28S-3104 |
| Course, magnetic 2/ | 214° | 214° | 239° | 239° | 261° | 273° | 277° | 090° | 321° | 173° | 241° | 067° | 044° |
| Sea | Moderate | Moderate | Moderate | Moderate | Moderate | Moderate | Rough | Moderate | Moderate | Moderate | Slight | Slight | Slight |
| Depth range in fathoms | 55-61 | 42-53 | 55-63 | 48-59 | 72-80 | 77-81 | 61-69 | 70-71 | 73-77 | 62-65 | 63-72 | 70-84 | 57-65 |
| Type of bottom | gn. M. | gn. M. & S. | gn. M. | gn. M. & S. | gn. M. | gn. M. | - | S. & Blds. | gn. M. | gn. M. | gn. M. & S. | gn. M. | gn. M. & S. |
| Trawling bottom | Clear | Clear | Clear | Clear | Clear | Clear | Clear | Snag | Snag | Clear | Clear | Clear | Clear |
| Time on bottom in minutes | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 7 | 60 | 60 | 60 | 60 | 60 |
| Shrimp catch in pounds: (whole shrimp per pound) 3/ | | | | | | | | | | | | | |
| Pink | 90 (151) | 60 (123) | 55 (149) | 210 (--) | 600 (118) | 95 (119) | 65 (104) | Trace 4/ | 250 (148) | 40 (184) | 45 (123) | 85 (120) | 55 (185) |
| Side-stripe | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total shrimp catch in pounds | 90 | 60 | 55 | 210 | 600 | 95 | 65 | - | 250 | 40 | 45 | 85 | 55 |
| Remarks | - | - | - | - | - | - | - | Beam broke | Net torn | - | - | - | - |

| Drag number | 40 (B.T.) 1/ | 41 (B.T.) | 42 (B.T.) | 43 (B.T.) | 44 (B.T.) | 45 (B.T.) | 46 (O.T.) | 47 (O.T.) | 48 (O.T.) | 49 (O.T.) | 50 (B.T.) | 51 (B.T.) | 52 (B.T.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | 11/6/55 | 11/7/55 | 11/7/55 | 11/7/55 | 11/7/55 | 11/7/55 | 11/8/55 | 11/8/55 | 11/8/55 | 11/8/55 | 11/8/55 | 11/9/55 | 11/9/55 |
| Latitude N. | 47°40.8' | 47°35.8' | 47°33.2' | 47°32.7' | 47°26.6' | 47°23.6' | 47°32.5' | 47°32.5' | 47°32.9' | 47°31.7' | 47°31.8' | 48°00.3' | 48°03.6' |
| Longitude W. | 124°39.8' | 124°36.2' | 124°33.8' | 124°47.5' | 124°44.3' | 124°43.5' | 124°48.1' | 124°48.3' | 124°48.3' | 124°36.5' | 124°35.8' | 124°36.7' | 124°38.2' |
| Loran reading | 28h-4231 | 28h-4230 | 28h-4230 | 28h-4249 | 28h-4242 | 28h-4232 | 28h-4247 | 28h-4246 | 28h-4247 | 28h-4285 | 28h-4262 | 28h-4270 | 28h-4270 |
| Loran reading | 28S-3077 | 28S-3140 | 28S-3177 | 28S-3218 | 28S-3287 | 28S-3313 | 28S-3216 | 28S-3216 | 28S-3212 | 28S-3148 | 28S-2995 | 28S-2906 | 28S-2866 |
| Course, magnetic 2/ | 333° | 169° | 132° | 177° | 150° | 160° | 161° | 165° | 170° | 332° | 337° | 119° | 165° |
| Sea | Slight | Moderate | Moderate | Moderate | Slight | Slight | Slight | Moderate | Slight | Smooth | Smooth | Moderate | Moderate |
| Depth range in fathoms | 78-81 | 78-88 | 78-79 | 61-65 | 57-58 | 63-65 | 61-64 | 61-64 | 61-63 | 81-85 | 54-57 | 48-51 | 56-57 |
| Type of bottom | gn.M. & Sh. | gn.M.S.& Sh. | gn.M.S.& Sh. | gn. M. & S. | gn. M. & S. | gn. M. & S. | - | - | gn. M. & S. | gn. M. & S. | gn. S. & Sh. | gn. S. | gn. S. |
| Trawling bottom | Clear | Clear | Clear | Clear | Clear | Clear | - | - | Clear | Clear | Clear | Clear | Clear |
| Time on bottom in minutes | 60 | 60 | 60 | 60 | 60 | 60 | - | - | 30 | 30 | 60 | 60 | 60 |
| Shrimp catch in pounds: (whole shrimp per pound) 3/ | | | | | | | | | | | | | |
| Pink | 45 (180) | 110 (165) | 190 (166) | 120 (135) | 80 (184) | 125 (139) | - | - | 135 (100) | 25 (100) | 60 (130) | Trace 4/ | Trace |
| Side-stripe | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total shrimp catch in pounds | 45 | 110 | 190 | 120 | 80 | 125 | - | - | 135 | 25 | 60 | - | - |
| Remarks | - | - | - | - | - | - | Net not on bottom | Net not on bottom | - | - | - | - | - |

1/Indicates type of gear; B.T. - beam trawl, O.T. - otter trawl.
2/Course given is between starting point and end point.
3/Figures in parentheses indicate number of whole shrimp per pound.
4/"Trace" - less than one pound of shrimp.
5/Night drag.

Symbols for Types of Bottom:

Blds. - boulders M. - mud
br. - brown S. - sand
gn. - green Sh. - shells
gy. - gray

Table 2 - Fishing Log--Shrimp Exploration Off The Washington Coast--Spring 1956--John N. Cobb

| Drag number | 1 (G.S.T.) [1] | 2 (G.S.T.) | 3 (G.S.T.) | 4 (G.S.T.) | 5 (G.S.T.) | 6 (G.S.T.) | 7 (G.S.T.) | 8 (G.S.T.) | 9 (G.S.T.) | 10 (G.S.T.) | 11 (G.S.T.) | 12 (G.S.T.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | 3/27/56 | 3/27/56 | 3/27/56 | 3/31/56 | 3/31/56 | 3/31/56 | 3/31/56 | 3/31/56 | 3/31/56 | 3/31/56 | 4/1/56 | 4/1/56 |
| Latitude N. | 47°08.6' | 47°04.4' | 46°51.7' | 46°46.5' | 46°48.7' | 46°48.3' | 46°51.8' | 46°52.7' | 46°54.6' | 46°52.3' | 46°46.7' | 46°43.7' |
| Longitude W. | 124°51.6' | 124°39.6' | 124°34.7' | 124°33.5' | 124°36.8' | 124°43.1' | 124°40.0' | 124°36.4' | 124°31.5' | 124°26.4' | 124°25.6' | 124°41.1' |
| Loran reading | 2H4-4098 | 2H4-4101 | 2H4-3970 | 2H4-3911 | 2H4-3931 | 2H4-3915 | 2H4-3961 | 2H4-3979 | 2H4-3990 | 2H4-3952 | 2H4-3891 | 2H4-3865 |
| Loran reading | 2H5-3333 | 2H5-3411 | 2H5-3437 | 2H5-3440 | 2H5-3428 | 2H5-3402 | 2H5-3415 | 2H5-3430 | 2H5-3408 | 2H5-3386 | 2H5-3392 | 2H5-3411 |
| Course, magnetic [2] | 073° | 090° | 084° | 307° | 254° | 266° | 055° | 298° | 246° | 229° | 116° | 138° |
| Sea | Moderate | Rough | Rough | Slight | Slight | Slight | Slight | Slight | Slight | Slight | Slight | Slight |
| Depth range in fathoms | 77-78 | 48 -56 | 54-56 | 57-60 | 65-72 | 76-83 | 61-70 | 60-62 | 69-77 | 82-86 | 83-87 | 76-84 |
| Type of bottom | gn. M. | gn. M. & S. | gn. M. & S. | gn. M. & S. | gn. M. & S. | gn. M. & S. | gn. M. & S. | gn. M. & S. | gn. M. & S. | gn. M. & S. | gn. M. | S. & hrd. |
| Trawling bottom | Clear | Snag | Clear | Clear | Clear | Snag | Clear | Clear | Clear | Clear | Clear | Clear |
| Time on bottom in minutes | 60 | 60 | 30 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| Shrimp catch in pounds: (whole shrimp per pound) [3] | | | | | | | | | | | | |
| Pink | 175 (167) | Trace [4] | 3 | 240 (134) | 250 (131) | Trace | 300 (131) | 230 (120) | 350 (120) | 400 (182) | 700 (142) | 20 (151) |
| Side-stripe | - | - | - | - | - | - | - | - | - | - | - | - |
| Total shrimp catch in pounds | 175 | Trace | 3 | 240 | 250 | Trace | 300 | 230 | 350 | 400 | 700 | 20 |
| Total shrimp catch, hourly basis | 175 | Trace | 6 | 240 | 250 | Trace | 300 | 230 | 350 | 400 | 700 | 20 |
| Remarks | - | Net torn | - | - | - | Net torn | - | - | - | - | - | - |

| Drag number | 13 (G.S.T.) [1] | 14 (G.S.T.) | 15 (G.S.T.) | 16 (G.S.T.) | 17 (B.T.) | 18 (B.T.) | 19 (B.T.) | 20 (B.T.) | 21 (B.T.) | 22 (B.T.) | 23 (B.T.) | 24 (B.T.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | 4/1/56 | 4/1/56 | 4/1/56 | 4/1/56 | 4/1/56 | 4/1/56 | 4/2/56 | 4/2/56 | 4/2/56 | 4/2/56 | 4/2/56 | 4/2/56 |
| Latitude N. | 46°38.0' | 46°39.1' | 46°37.6' | 46°40.3' | 46°41.9' | 46°43.5' | 46°45.1' | 46°53.4' | 46°54.7' | 46°54.7' | 46°54.6' | 46°52.4' |
| Longitude W. | 124°39.1' | 124°34.8' | 124°28.5' | 124°28.3' | 124°35.4' | 124°36.3' | 124°37.7' | 124°43.3' | 124°45.4' | 124°41.4' | 124°44.4' | 124°45.8' |
| Loran reading | 2H4-3801 | 2H4-3819 | 2H4-3809 | 2H4-3842 | 2H4-3852 | 2H4-3870 | 2H4-3888 | 2H4-3972 | 2H4-3980 | 2H4-3991 | 2H4-3982 | 2H4-3955 |
| Loran reading | 2H5-3417 | 2H5-3432 | 2H5-3451 | 2H5-3463 | 2H5-3431 | 2H5-3429 | 2H5-3424 | 2H5-3400 | 2H5-3389 | 2H5-3408 | 2H5-3394 | 2H5-3389 |
| Course, magnetic [2] | 109° | 146° | 306° | 289° | 002° | 304° | 322° | 157° | 066° | 248° | 085° | 231° |
| Sea | Slight | Moderate | Moderate | Moderate | Moderate | Moderate | Slight | Slight | Slight | Slight | Smooth | Smooth |
| Depth range in fathoms | 90-105 | 73-74 | 60-62 | 54-60 | 68-72 | 72-74 | 69-74 | 73-75 | 69-76 | 66-77 | 76-82 | 82-86 |
| Type of bottom | Cl. S. & Rks. | Rks. & hrd. | gn. M. & S. | gn.S.Rks.& G. | gn. M. & S. | gn. M. & S. | gn.S.Cl.& hrd. | gn. M. & S. | gn. M. & S. | gn. M. & S. | gn. M. & S. | gn. M. & S. |
| Trawling bottom | Snag | Snag | Clear | Snag | Clear | Clear | Clear | Clear | Clear | Clear | Clear | Clear |
| Time on bottom in minutes | 60 | 7 | 60 | 44 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| Shrimp catch in pounds: (whole shrimp per pound) [3] | | | | | | | | | | | | |
| Pink | 5 (116) | - | 150 (130) | 30 (115) | 30 (118) | 25 (109) | 3 | 225 (109) | 120 (133) | 175 (149) | 200 (142) | 65 (176) |
| Side-stripe | - | - | - | - | - | - | - | - | - | - | - | - |
| Total shrimp catch in pounds | 5 | - | 150 | 30 | 30 | 25 | 3 | 225 | 120 | 175 | 200 | 65 |
| Total shrimp catch, hourly basis | 5 | - | 150 | 41 | 30 | 25 | 3 | 225 | 120 | 175 | 200 | 65 |
| Remarks | Net torn | Net torn Hung up | - | Net torn Hung up | - | - | - | - | - | - | - | - |

Note: For explanation of footnotes and abbreviations, see p. 24.

Table 2 - Fishing Log--Shrimp Exploration Off The Washington Coast--Spring 1956--John N. Cobb (Contd.)

| Drag number | 25 (B.T.) [1] | 26 (B.T.) | 27 (B.T.) | 28 (B.T.) | 29 (B.T.) | 30 (B.T.) | 31 (B.T.) | 32 (B.T.) | 33 (B.T.) | 34 (O.T.) | 35 (O.T.) | 36 (O.T.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | 4/2/56 | 4/3/56 | 4/3/56 | 4/3/56 | 4/3/56 | 4/3/56 | 4/3/56 | 4/3/56 | 4/3/56 | 4/4/56 | 4/4/56 | 4/4/56 |
| Latitude N. | 46°51.8' | 46°50.1' | 46°46.7' | 46°46.6' | 46°44.9' | 46°48.8' | 46°49.1' | 46°49.5' | 46°52.3' | 46°51.8' | 46°52.0' | 46°49.0' |
| Longitude W. | 124°48.9' | 124°50.4' | 124°46.1' | 124°45.7' | 124°42.8' | 124°45.9' | 124°39.3' | 124°35.8' | 124°36.5' | 124°42.0' | 124°42.5' | 124°38.8' |
| Loran reading | 2H4-3960 | 2H4-3918 | 2H4-3890 | 2H4-3890 | 2H4-3876 | 2H4-3914 | 2H4-3931 | 2H4-3962 | 2H4-3973 | 2H4-3990 | 2H4-3958 | 2H4-3931 |
| Loran reading | 2H5-3374 | 2H5-3369 | 2H5-3390 | 2H5-3393 | 2H5-3404 | 2H5-3390 | 2H5-3418 | 2H5-3432 | 2H5-3429 | 2H5-3405 | 2H5-3404 | 2H5-3420 |
| Course, magnetic [2] | 099° | 119° | 111° | 109° | 296° | 050° | 074° | 325° | 249° | 202° | 184° | 101° |
| Sea | Smooth | Smooth | Smooth | Smooth | Slight | Slight | Slight | Slight | Moderate | Rough | Moderate | Moderate |
| Depth range in fathoms | 82-86 | 90-93 | 87-88 | 82-87 | 80-85 | 76-82 | 64-71 | 68-63 | 60-65 | 70-74 | 70-73 | 65-69 |
| Type of bottom | gn. M. & S. | gn. S. & Sh. | gn.M. & gy.Cl. | gn. M. | gn. M. | gn. M. | gn. M. & Sh. | gn. M. & S. | gn. M. & S. | gn. M. & S. | gn. M. & S. | gn. M. & S. |
| Trawling bottom | Clear | Clear | Clay bank | Clear | Clear | Clear | Clear | Clear | Soft | Clear | Clear | Clear |
| Time on bottom in minutes | 60 | 60 | 10 | 60 | 60 | 60 | 60 | 60 | 60 | 30 | 60 | 60 |
| Shrimp catch in pounds: (whole shrimp per pound) [3] | | | | | | | | | | | | |
| Pink | 90 (156) | 40 (163) | - | 150 (153) | 275 (123) | 40 (129) | 120 (116) | 90 (110) | 120 (118) | 300 | 150 (121) | 325 (120) |
| Side-stripe | - | Trace [4] | - | - | - | - | - | - | - | - | - | - |
| Total shrimp catch in pounds | 90 | 40 | - | 150 | 275 | 40 | 120 | 90 | 120 | 300 | 150 | 325 |
| Total shrimp catch, hourly basis | 90 | 40 | - | 150 | 275 | 40 | 120 | 90 | 120 | 600 | 150 | 325 |
| Remarks | - | - | Seam broke Hung up | - | - | - | - | - | - | - | - | - |

| Drag number | 37 (B.T.) [1] | 38 (B.T.) | 39 (B.T.) | 40 (B.T.) | 41 (B.T.) | 42 (B.T.) | 43 (B.T.) | 44 (B.T.) | 45 (B.T.) | 46 (B.T.) | 47 (B.T.) | 48 (I.T.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | 4/7/56 | 4/7/56 | 4/7/56 | 4/7/56 | 4/8/56 | 4/8/56 | 4/8/56 | 4/8/56 | 4/8/56 | 4/8/56 | 4/9/56 | 4/9/56 |
| Latitude N. | 46°56.1' | 46°58.4' | 46°59.2' | 47°00.6' | 46°57.9' | 46°56.0' | 46°59.5' | 47°00.8' | 47°08.5' | 47°07.4' | 47°09.7' | 47°30.7' |
| Longitude W. | 124°37.6' | 124°38.4' | 124°43.2' | 124°44.3' | 124°44.8' | 124°45.7' | 124°49.2' | 124°52.1' | 124°52.0' | 124°48.4' | 124°48.0' | 124°48.2' |
| Loran reading | 2H4-4017 | 2H4-4040 | 2H4-4036 | 2H4-4047 | 2H4-4018 | 2H4-3995 | 2H4-4021 | 2H4-4025 | 2H4-4096 | 2H4-4100 | 2H4-4238 | 2H4-4241 |
| Loran reading | 2H5-3425 | 2H5-3421 | 2H5-3397 | 2H5-3390 | 2H5-3390 | 2H5-3387 | 2H5-3366 | 2H5-3348 | 2H5-3331 | 2H5-3356 | 2H5-3240 | 2H5-3230 |
| Course, magnetic [2] | 338° | 290° | 063° | 067° | 130° | 333° | 236° | 313° | 190° | 125° | 007° | 307° |
| Sea | Moderate | Moderate | Moderate | Moderate | Smooth | Smooth | Smooth | Smooth | Smooth | Smooth | Smooth | Slight |
| Depth range in fathoms | 57-58 | 56-59 | 59-69 | 60-69 | 72-78 | 78-81 | 85-91 | 89-91 | 78-81 | 70-73 | 58-65 | 64-66 |
| Type of bottom | gn. M. | gn. M. & S. | gn. M. & S. | gn.M.S. & Sh. | gn. M. & S. | gn. M. & Cl. | gn.M.S. & Sh. | gy. M. & S. | gn. M. & S. | gn. M. | gn. M. & S. | gn. M. & S. |
| Trawling bottom | Clear | Clear | Clear | Clear | Clear | Clear | Clear | Clear | Clear | Clear | Clear | Clear |
| Time on bottom in minutes | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| Shrimp catch in pounds: (whole shrimp per pound) [3] | | | | | | | | | | | | |
| Pink | 10 (102) | 35 (103) | 30 (119) | 65 (104) | 55 (125) | 4 | 25 (156) | 50 | 90 (157) | 125 | 140 | 250 (163) |
| Side-stripe | - | - | - | - | - | - | Trace [4] | Trace | - | - | - | - |
| Total shrimp catch in pounds | 10 | 35 | 30 | 65 | 55 | 4 | 25 | 50 | 90 | 125 | 140 | 250 |
| Total shrimp catch, hourly basis | 10 | 35 | 30 | 65 | 55 | 4 | 25 | 50 | 90 | 125 | 140 | 250 |
| Remarks | - | - | - | - | - | - | - | - | - | - | - | - |

Note: For explanation of footnotes and abbreviations, see p. 24.

Table 2 - Fishing Log--Shrimp Exploration Off The Washington Coast--Spring 1956--John N. Cobb (Contd.)

| Drag number | 49 (B.T.) [1] | 50 (B.T.) | 51 (G.S.T.) | 52 (G.S.T.) | 53 (G.S.T.) | 54 (G.S.T.) | 55 (G.S.T.) | 56 (G.S.T.) | 57 (G.S.T.) | 58 (B.T.) | 59 (B.T.) | 60 (B.T.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | 4/9/56 | 4/9/56 | 4/9/56 | 4/9/56 | 4/9/56 | 4/9/56 | 4/12/56 | 4/12/56 | 4/12/56 | 4/12/56 | 4/12/56 | 4/13/56 |
| Latitude N. | 47°31.5' | 47°31.5' | 47°31.9' | 47°32.1' | 47°28.1' | 47°23.1' | 46°36.0' | 46°29.9' | 46°26.0' | 46°22.6' | 46°23.2' | 46°31.6' |
| Longitude W. | 124°52.8' | 124°55.5' | 124°56.2' | 124°49.7' | 124°45.8' | 124°43.5' | 124°32.2' | 124°26.9' | 124°29.4' | 124°23.6' | 124°32.0' | 124°29.9' |
| Loran reading | 2H-4028 | 2H-4028 | 2H-4027 | 2H-4040 | 2H-4041 | 2H-4030 | 2H-3785 | 2H-3715 | 2H-3665 | 2H-3628 | 2H-3630 | 2H-3733 |
| Loran reading | 2H5-3197 | 2H5-3155 | 2H5-3148 | 2H5-3210 | 2H5-3266 | 2H5-3317 | 2H5-3439 | 2H5-3450 | 2H5-3441 | 2H5-3453 | 2H5-3432 | 2H5-3413 |
| Course, magnetic [2] | 312° | 306° | 129° | 133° | 130° | 159° | 110° | 135° | 122° | 089° | 033° | 023° |
| Sea | Slight | Moderate | Moderate | Moderate | Rough | Rough | Moderate | Moderate | Moderate | Moderate | Moderate | Moderate |
| Depth range in fathoms | 79-81 | 82-84 | 82-83 | 64-66 | 58-60 | 63-65 | 75-80 | 62-71 | 60-65 | 55-58 | 76-77 | 85-103 |
| Type of bottom | gn. M. & S. | gn. M. & S. | gn. M. & S. | gn. M. & S. | gn. M. | gn. M. & S. | M. | M. S. & St. | Cl. & M. | gy.M.S. & Cl. | M. & S. | Cl. |
| Trawling bottom | Clear | Clear | Clear | Clear | Clear | Clear | Clear | Snag | Snag | Clear | Clear | Clay bank |
| Time on bottom in minutes | 60 | 60 | 60 | 60 | 60 | 35 | 60 | 60 | 60 | 90 | 60 | 60 |
| Shrimp catch in pounds: (whole shrimp per pound) [3] | | | | | | | | | | | | |
| Pink | 240 (198) | 180 (198) | 590 (214) | 720 (161) | Trace | Trace | 315 (133) | 100 (114) | Trace | Trace | 10 (170) | Trace |
| Side-stripe | --- | Trace [4] | Trace | - | - | - | - | - | - | - | - | - |
| Total shrimp catch in pounds | 240 | 180 | 590 | 720 | Trace | Trace | 315 | 100 | Trace | Trace | 10 | Trace |
| Total shrimp catch, hourly basis | 240 | 180 | 590 | 720 | Trace | Trace | 315 | 100 | Trace | Trace | 10 | Trace |
| Remarks | - | - | - | - | - | - | - | Net torn | Net torn | - | - | Beam broke |

| Drag number | 61 (G.S.T.) [1] | 62 (G.S.T.) | 63 (G.S.T.) | 64 (B.T.) | 65 (B.T.) | 66 (B.T.) | 67 [5] (G.S.T.) | 68 [5] (G.S.T.) | 69 (G.S.T.) | 70 (G.S.T.) | 71 (G.S.T.) | 72 (G.S.T.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | 4/15/56 | 4/15/56 | 4/15/56 | 4/15/56 | 4/15/56 | 4/15/56 | 4/15/56 | 4/15/56 | 4/16/56 | 4/16/56 | 4/16/56 | 4/16/56 |
| Latitude N. | 47°01.5' | 47°06.5' | 47°01.9' | 47°08.0' | 47°10.2' | 47°14.8' | 47°06.3' | 47°06.0' | 47°06.1' | 47°01.8' | 47°10.0' | 47°22.2' |
| Longitude W. | 124°43.3' | 124°49.4' | 124°53.5' | 124°55.4' | 124°56.6' | 124°50.9' | 124°49.1' | 124°49.1' | 124°49.4' | 124°49.2' | 124°46.5' | 124°43.8' |
| Loran reading | 2H-4090 | 2H-4088 | 2H-4059 | 2H-4080 | 2H-4093 | 2H-4150 | 2H-4087 | 2H-4081 | 2H-4081 | 2H-4073 | 2H-4130 | 2H-4225 |
| Loran reading | 2H5-3391 | 2H5-3352 | 2H5-3332 | 2H5-3312 | 2H5-3297 | 2H5-3313 | 2H5-3354 | 2H5-3355 | 2H5-3353 | 2H5-3357 | 2H5-3360 | 2H5-3321 |
| Course, magnetic [2] | 348° | 160° | 128° | 345° | 001° | 293° | 160° | 330° | 151° | 336° | 339° | 337° |
| Sea | Moderate | Moderate | Slight | Slight | Slight | Slight | Slight | Slight | Slight | Slight | Slight | Smooth |
| Depth range in fathoms | 62-62 | 76-78 | 83-86 | 90-94 | 126-139 | 100-111 | 76-78 | 75-76 | 76-77 | 71-76 | 69-70 | 63-65 |
| Type of bottom | gn. M. | gn. M. | gy. M. | M. & S. | gy. M. & S. | gn. M. & S. | gn. M. | gn. M. | gn. M. | gn. M. | gn. M. | gn. M. |
| Trawling bottom | Clear | Clear | Clear | Clear | Clear | Clear | Clear | Clear | Clear | Clear | Clear | Clear |
| Time on bottom in minutes | 30 | 30 | 30 | 60 | 30 | 45 | 30 | 30 | 30 | 30 | 30 | 30 |
| Shrimp catch in pounds: (whole shrimp per pound) [3] | | | | | | | | | | | | |
| Pink | 80 (139) | 800 (131) | 4 | Trace [4] | Trace | Trace | 4 (139) | 7 (121) | 490 | 525 (164) | 1100 (132) | 210 (169) |
| Side-stripe | - | - | - | - | 1 (48) | Trace | - | - | - | - | - | - |
| Total shrimp catch in pounds | 80 | 800 | 4 | Trace | 1 | Trace | 4 | 7 | 490 | 525 | 1100 | 210 |
| Total shrimp catch, hourly basis | 160 | 1600 | 8 | Trace | 2 | Trace | 8 | 14 | 980 | 1050 | 2200 | 420 |
| Remarks | - | - | - | - | - | - | - | - | - | - | - | - |

Note: For explanation of footnotes and abbreviations, see p. 24.

Table 3 - Fishing Log--Shrimp Exploration Off The Washington Coast--Spring 1956--John N. Cobb (Contd.)

| Drag number | 73 (O.S.T.) 1/ | 74 (O.S.T.) | 75 (O.S.T.) | 76 (O.S.T.) | 77 (O.S.T.) | 78 (O.S.T.) | 79 (O.S.T.) | 80 (O.S.T.) | 81 (O.S.T.) | 82 (O.S.T.) | 83 2/ (O.S.T.) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | 4/16/56 | 4/16/56 | 4/16/56 | 4/17/56 | 4/17/56 | 4/17/56 | 4/17/56 | 4/17/56 | 4/17/56 | 4/17/56 | 4/17/56 |
| Latitude N. | 47°21.5' | 47°26.9' | 47°21.5' | 47°05.2' | 47°10.6' | 47°14.2' | 47°11.8' | 47°09.6' | 47°07.3' | 47°03.0' | 47°08.7' |
| Longitude W. | 124°42.5' | 124°44.5' | 124°46.5' | 124°44.9' | 124°46.5' | 124°47.4' | 124°52.4' | 124°50.5' | 124°48.6' | 124°47.4' | 124°49.5' |
| Loran reading | - | 28h-4212 | 28h-4214 | 28h-4092 | 28h-4135 | 28h-4160 | 28h-4123 | 28h-4111 | 28h-4099 | 28h-4061 | 28h-4107 |
| Loran reading | - | 28S-3283 | 28S-3315 | 28S-3381 | 28S-3398 | 28S-3340 | 28S-3318 | 28S-3337 | 28S-3354 | 28S-3570 | 28S-3345 |
| Course, magnetic 3/ | 314° | 309° | 156° | 328° | 342° | 172° | 176° | 117° | 122° | 162° | 295° |
| Sea | Smooth | Smooth | Smooth | Slight | Slight | Slight | Slight | Moderate | Moderate | Moderate | Moderate |
| Depth range in fathoms | 57-58 | 58-60 | 77-82 | 65-66 | 69-70 | 76-78 | 86-86 | 76-79 | 70-74 | 75-77 | 77-80 |
| Type of bottom | gn. M. & S. | gn. M. | gn. M. | gn. M. | gn. M. | gn. M. | gn. S. | gn. M. | gn. M. | hrd. | gn. M. |
| Trawling bottom | Clear | Clear | Clear | Clear | Clear | Clear | Clear | Clear | Clear | Snag | Clear |
| Time on bottom in minutes | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 10 | 30 |
| Shrimp catch in pounds: (whole shrimp per pound) 3/ | | | | | | | | | | | |
| Pink | 185 (175) | 360 (208) | 125 (197) | 125 (138) | 610 (132) | 490 (118) | 2 1/2 | 900 (111) | 430 (130) | 10 | 5 (111) |
| Side-stripe | - | - | Trace 4/ | - | - | - | - | - | - | - | - |
| Total shrimp catch in pounds | 185 | 360 | 125 | 125 | 610 | 490 | 2 1/2 | 900 | 430 | 10 | 5 |
| Total shrimp catch, hourly basis | 370 | 720 | 250 | 250 | 1220 | 980 | 5 | 1800 | 860 | 60 | 10 |
| Remarks | - | - | - | - | - | - | - | - | - | Net torn Hung up | - |

| Drag number | 84 2/ (O.S.T.) 5/ | 85 (O.S.T.) | 86 (O.S.T.) | 87 (O.S.T.) | 88 (O.S.T.) | 89 (O.S.T.) | 90 (O.S.T.) | 91 (O.S.T.) | 92 (O.T.) | 93 (O.T.) | 94 (O.T.) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | 4/17/56 | 4/18/56 | 4/18/56 | 4/18/56 | 4/18/56 | 4/18/56 | 4/18/56 | 4/18/56 | 4/19/56 | 4/19/56 | 4/19/56 |
| Latitude N. | 47°08.9' | 47°08.3' | 47°09.4' | 47°08.2' | 47°09.4' | 47°08.0' | 47°09.0' | 47°08.1' | 47°08.8' | 47°12.6' | 47°40.5' |
| Longitude W. | 124°49.9' | 124°48.4' | 124°49.8' | 124°49.4' | 124°49.2' | 124°49.9' | 124°49.7' | 124°50.2' | 124°49.8' | 124°48.2' | 125°00.0' |
| Loran reading | 28h-4108 | 28h-4108 | 28h-4113 | 28h-4103 | 28h-4115 | 28h-4100 | 28h-4110 | 28h-4100 | 28h-4108 | 28h-4116 | 28h-4230 |
| Loran reading | 28S-3343 | 28S-3353 | 28S-3362 | 28S-3347 | 28S-3365 | 28S-3345 | 28S-3343 | 28S-3343 | 28S-3343 | 28S-3341 | 28S-3078 |
| Course, magnetic 3/ | 138° | 297° | 128° | 332° | 155° | 355° | 114° | 007° | 324° | 357° | 355° |
| Sea | Moderate | Moderate | Moderate | Moderate | Moderate | Moderate | Moderate | Moderate | Slight | Slight | Slight |
| Depth range in fathoms | 76-78 | 75-79 | 74-78 | 76-78 | 74-77 | 76-77 | 74-77 | 75-77 | 78-81 | 75-77 | 77-83 |
| Type of bottom | gn. M. | gn. M. | gn. M. | gn. M. | gn. M. | gn. M. | gn. M. | gn. M. | gn. M. | gn. M. | gn. M. |
| Trawling bottom | Clear | Clear | Clear | Clear | Clear | Clear | Clear | Clear | Clear | Clear | Clear |
| Time on bottom in minutes | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 60 | 60 |
| Shrimp catch in pounds: (whole shrimp per pound) 3/ | | | | | | | | | | | |
| Pink | 5 (96) | 1050 (128) | 650 (125) | 925 (142) | 855 (124) | 560 (117) | 590 (111) | 580 (118) | 35 | 200 | 70 |
| Side-stripe | - | - | - | - | - | - | - | - | - | - | - |
| Total shrimp catch in pounds | 5 | 1050 | 650 | 925 | 855 | 560 | 590 | 580 | 35 | 200 | 70 |
| Total shrimp catch, hourly basis | 10 | 2100 | 1300 | 1850 | 1710 | 1120 | 1180 | 1160 | 70 | 200 | 70 |
| Remarks | - | - | - | - | - | - | - | - | - | - | - |

1/Indicates type of gear; B.T. - beam trawl; O.T. - otter trawl; G.S.T. - Gulf shrimp trawl.
2/Course given is between starting point and end point.
3/Figures in parentheses indicate number of whole shrimp per pound.
4/"Trace" - less than one pound of shrimp.
5/Night drag.

Symbols for Types of Bottom:

| | | | |
|---|---|---|---|
| Blds. | - boulders | hrd. | - hard |
| Cl. | - clay | M. | - mud |
| G. | - gravel | S. | - sand |
| gy. | - gray | St. | - stones |
| gn. | - green | | |

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## MULTIMILLION-DOLLAR MEAT PROMOTION PLAN

Programs conducted by competing protein producers, such as outlined below, emphasize the need for the commercial fishing industry to collaborate on national promotional programs to maintain and increase its markets. In today's competitive market, local, regional, and national fish-producing groups cannot overlook any opportunity to make the consumer want to buy fish in preference to other competing products.

If the attitudes of several hundred livestock producers are representative, the livestock industry may be ready to indorse a multimillion-dollar national livestock meat promotion plan. A recent survey revealed that nearly 99 percent of the persons polled by the Iowa Beef Producers Association indicated a further need for research, education, and promotion to increase the consumption of meat The program would be financed by a uniform check-off on all livestock sold for slaughter. At the end of each calendar month, these funds would be forwarded to a national livestock promotion commission for distribution. A straight across-the-board five cents per 100-pound-weight assessment is being considered which will raise about $28,000,000 yearly. Of the funds so derived, 40 percent would be slated for the National Livestock and Meat Board; another 40 percent will be distributed among the National Livestock Councils, e.g., the National Beef Council, and the National Lamb Feeders Association; and the remaining 20 percent of the funds would go to the State producer councils.

# CHEMICAL COMPOUNDS FORMED DURING THE SPOILAGE OF FISH

ABSTRACT

A progress report on a chromatographic study of the protein-breakdown products appearing in the meat of fish during spoilage. Free ninhydrin-reactive components such as the amino acids were studied on homogenates of iced round fish and of minced fish throughout a 15-day storage period. No ninhydrin-reactive compounds other than those reported were observed. No significant increases in free amino acids were noted though free lysine apparently decreased in quantity during storage.

## INTRODUCTION

Different types of spoilage occur in fish of different species and even in fish of the same species, depending upon such factors as the variations in the chemical constituents of the muscle of different species, the conditions of handling during storage, and the kinds of enzymes and bacteria involved. A knowledge of why different types of spoilage occur under various handling conditions and of what types of chemical compounds are formed would be of great value in preservation studies and in the development of objective tests for determining the freshness of fish. Consequently the Seattle Fishery Technological Laboratory of the U. S. Fish and Wildlife Service began a study of the various types of chemical compounds that are formed in the meat of fish when spoilage occurs.

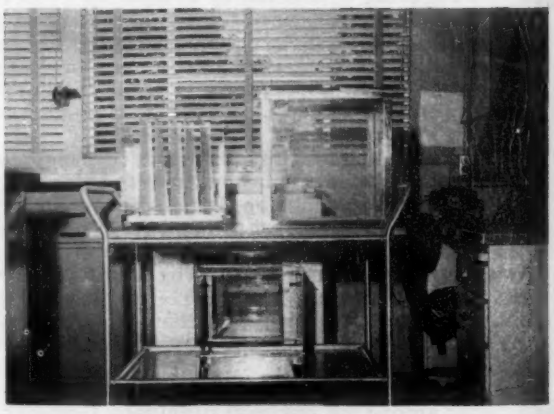

Fig. 1 - Chromatographic equipment.

Work to date has included a preliminary investigation of protein-breakdown products such as amino acids and amines. Qualitative (identifying) and semi-quantitative (not wholly precise measurement of amounts) determination of these substances have been made by means of filter-paper chromatography. This technique is well adapted for making preliminary separations and identifications of the wide range of substances that may form in small quantities in fish meat during spoilage.

In paper chromatography, a small drop of the solution containing the substances to be separated is applied to a strip or a sheet of filter paper at a short distance from one end of the paper. The drop is allowed to dry. The end of the paper nearest to the spot is placed in the "developing" solvent, which usually is water con-

taining an organic solvent. The developing solvent flows by capillary action past the original spot and up the length of the paper. Because the various substances in the original spot have different rates of flow in this solvent, they are separated and may be identified by position, shape, and color of the spots that form subsequently. Although much work has been done in recent years in the field of paper chromatography, in any particular application much additional research work often is necessary on the use of various combinations of solvents, filter papers, and methods of detecting spots before the compounds in any particular product can be separated and identified satisfactorily.

The free amino acid content in fish of varying degrees of freshness has been investigated by several workers. Amano and Bito (1950) found glycine, alanine, and glutamic acid in all species examined and also found that other amino acids appeared during the decomposition of fish muscle. Jones (1954) found that the free amino acid composition of North Sea codling muscle varied with the season and changed considerably when the muscle was stored in ice, owing (1) to leaching by the melting ice and to the action of autolytic enzymes during the earlier period of storage and (2) to the added effects of spoilage micro-organisms during the later period of storage.

Fig. 2 - Standard chromatogram.

Pacific cod (Gadus Macrocephalus) was chosen for the studies reported in the present paper because it is a fish that is available throughout the year in relatively large quantities in Seattle. The cod were stored in two different forms: whole fish and ground fish muscle. Often in experimental work it is desirable to grind and mix all of the fish being studied in order that the samples will be homogeneous and representative of the entire lot. Grinding the fish, however, may introduce variables that are not present in work with the whole fish. The data presented here include results both from whole fish and from ground fish.

## EXPERIMENTAL PROCEDURE

The reaction of ninhydrin with compounds containing the amine groups--such as amino acids and amines--to give distinctive colored compounds is used as the basis for studying protein-breakdown products during the spoilage of fish. In the present work, the free amino acids and other ninhydrin-reactive substances in cod muscle were studied by two-dimensional paper chromatography to determine what changes in the ninhydrin-reactive substances occur as the muscle deteriorates during refrigerated storage.

Two groups of fish were studied. The first group, called lot 1, consisted of Pacific cod that had been stored aboard the vessel in the round in ice for 4 or 5 days. The second group, lot 2, was not iced but was stored for 2 days aboard the vessel on top of other iced fish. The second lot of cod was used to check the results obtained with the first one. The difference in treatment of the cod aboard the fishing vessel was not part of the experimental design and is reported only to make the history of the samples complete. The exact treatment given each lot of fish is shown in table 1.

In the analysis of the samples for free amino acids and other ninhydrin reactive substances, the aqueous fraction was extracted from cod muscle by the method outlined by Block, Durrum, and Zweig (1955). The procedure used is as follows:

1. Mix 25 grams of cod meat with 80 milliliters of absolute ethanol in an electric blendor for 5 minutes.
2. Separate out the solid material by suction filtration, wash the solids with 80-percent ethanol, add the washings to the filtrate, and then discard the solids.
3. Transfer the filtrate to a separatory funnel, add three volumes of chloroform to each volume of the filtrate, and shake the mixture thoroughly.
4. Allow the two layers in the funnel to separate, then discard the bottom layer.
5. Concentrate the aqueous (upper) layer to a volume of 5 to 10 milliliters (accurately measured).

The ninhydrin-reactive constituents of the extract are separated by two-dimensional paper chromatography. The solvent used for separation in the first direction consists of liquid phenol and metal-free water (4:1 v/v) and 0.04 percent 8 hydroxyquinoline; the solvent used for separation in the second direction consists of 2,6-lutidine, 2, 4, 6-collidine, water, and diethylamine (100:100:100:3 v/v) (Block et al. 1955). The various compounds that separate are detected by dipping the chromatograms in 0.25 percent (w/v) ninhydrin in acetone (Toennies 1951). After the chromatogram is dried in a hood, the color is developed by placing the chromatogram in a warm oven at about 85° C. for 5 to 10 minutes. Spots of varying colors and shapes appear as a result of the reaction between ninhydrin and the various separated compounds.

Table 1 - Changes in Free Amino Acid Content (As Determined by Paper Chromatography) of Cod with Length of Time of Refrigerated Storage

| Lot | History of Samples | | | Sample No. | Free Amino Acids Content 1/ | | |
|---|---|---|---|---|---|---|---|
| | Aboard Vessel | At the Laboratory | | | | | |
| | | Treatment | Storage Time | | Lysine | Valine and Leucines | Glutamic Acid, Glycine Taurine, Proline, α - and β-Alanine |
| | | | Days | | | | |
| 1 | Pacific cod, in the round, stored in ice for 4 or 5 days | Fillets cut into small particles in meat chopper, mixed thoroughly, filled into jars with snap-on plastic covers, and stored at 34° F. | 0 | 7M | + | + | + |
| | | | 12 | 8F | Trace | Trace | + |
| | | | 15 | 9E | - | Trace | + |
| | | Round fish stored in ice | 15 | 9D | - | + | + |
| 2 | Pacific cod, not iced but stored on top of other iced fish for 2 days; the internal temperature of the cod was 43° to 46° F. when they were obtained. | Fillets cut into small particles in meat chopper, mixed thoroughly, filled into jars with snap-on plastic covers, and stored at 34° F. | 0 | 10B | + | + | + |
| | | | | 10C | + | + | + |
| | | | | 10D | + | + | + |
| | | | | 10F | + | + | + |
| | | | 6 | 11A | Trace | Trace | + |
| | | | | 11B | + | Trace | + |
| | | | 10 | 12A | - | + | + |
| | | | | 12C | - | + | + |
| | | | | 12B | Trace | + | + |
| | | | 27 | 12G | - | + | + |
| | | Round fish stored in ice | 6 | 11C | + | + | + |
| | | | | 11D | + | + | + |
| | | | 10 | 12D | Trace | + | + |
| | | | | 12E | Trace | + | + |

1/ A plus indicates that a definite chromatographic spot was found, and a minus indicates that no spot was found.

A series of standard solutions containing various combinations of pure amino acids and amines are also chromatographed, and each of the various compounds is ultimately identified on the "standard" chromatogram. The spots appearing on the chromatograms of the various cod samples then are identified by comparing them with the known spots on the standard chromatogram.

## RESULTS

The data obtained with lot 1 (table 1) indicated the following: (1) free lysine, valine, leucines, glutamic acid, glycine, taurine, proline, and α-and β-alanine were present in the fresh samples; (2) no changes were detected in the amount of glutamic acid, glycine, taurine, proline, and α-and β-alanine as the samples were stored; (3) the amounts of valine and of leucines decreased in the ground samples stored in jars at 34° F. but not in the whole fish stored in ice; (4) the amount of lysine decreased both in the ground sample stored at 34° F. and in the whole fish stored in ice.

The results obtained with lot 2 are in essential agreement with those obtained with lot 1, except that the amounts of valine and of leucines decreased only in the ground samples stored for 6 days but not in any of the other ground samples.

Except for the amino acids shown in table 1, no other ninhydrin-reactive compounds were found by the experimental procedure used.

## SUMMARY

In a study of the various types of chemical compounds that are found in fish meat when spoilage occurs, Pacific cod (Gadus macrocephalus) were stored in the round in ice, and samples of the ground cod were stored in jars at 34° F. Paper chromatography was used to detect the ninhydrin-reactive compounds. Free lysine, valine, leucines, glutamic acid, glycine, taurine, proline, and $\alpha$- and $\zeta$-alanine were detected in the fresh samples. Lysine decreased in quantity in the samples during storage. No changes in the quantities of glutamic acid, glycine, taurine, proline, and $\alpha$ - and $\zeta$-alanine were detected. The results obtained to date are not sufficiently conclusive to establish a definite difference between whole samples and ground samples. Other than the compounds already reported in this summary, no other ninhydrin-reactive substances were found by the experimental procedure used.

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## "GRAYING" IN CANNED SHRIMP

Research on the most prevalent form of discoloration--"graying"--in canned wet pack shrimp has shown that the discoloration is dependent upon the age or condition of the shrimp prior to canning. That is, as the age of the shrimp in ice increased, both the pH and the amount of "graying" increased in the canned product. It was also noted that black iron sulphide container discoloration was more likely to occur with an elevated product pH (Food Technology, May 1956).

# TECHNICAL NOTE NO.36 - DETERMINING FISH CONTENT OF FROZEN FRIED FISH STICKS

ABSTRACT

This report describes the basic procedure for determining the content of the meat of fish in frozen fried fish sticks. The procedure offers packers a simple and rapid method of analysis that can be used conveniently as a tool in the control of quality. The procedure is useful also in determining compliance with the proposed standards for grades of frozen fried fish sticks.

## INTRODUCTION

The voluntary Federal Standards for Grades of Frozen Fried Fish Sticks (Federal Register 1956) provide that frozen fried fish sticks contain not less than 60 percent, by weight, of fish meat. The Technological Laboratory of the U. S. Fish and Wildlife Service at East Boston, Mass., developed a method of analysis capable of determining compliance with this requirement.

The method that was developed is simple and rapid. It consists, essentially, of the following steps: (1) weigh the whole frozen fried fish stick, (2) dip the fish stick in a colored solution (copper sulfate) at room temperature for a specified time, (3) remove the coating on the fish stick by scraping the stick with a spatula, (4) weigh the remaining fish meat, and (5) calculate the content of fish meat in the fish stick by use of the formula:

$$\text{Percent fish meat} \quad \frac{(\text{wt. of fish meat after removal of coating})\ 100}{(\text{wt. of whole frozen-fried fish stick})}$$

## PROCEDURE

APPARATUS AND MATERIALS:

1. Triple-beam or similar rapid-weighing balance that is sensitive to $\pm$ 0.05 gram.
2. Two-liter beaker.
3. Copper-sulfate solution.
4. Immersion thermometer.
5. Clip tongs of wire, plastic, or glass.
6. Stop watch or regular watch with second hand.
7. Ordinary paper towels.
8. Spatula, 4-inch blade with rounded tip.
9. Container for waste breading and fish.
10. Glass funnel, medium size.
11. Glass wool, coarse filter paper, or paper towel.

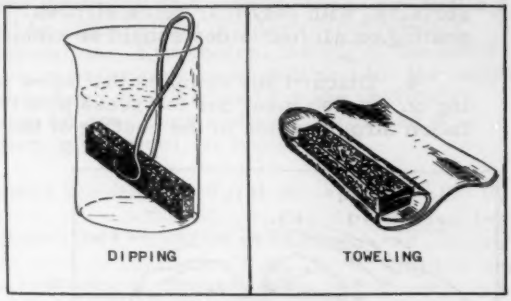
PREPARATION OF THE DIPPING SOLUTION: Dissolve approximately 250 grams of copper sulfate crystals ($CuSO_4.5H_2o$) in a small quantity of hot water. Add cold water to bring to 1 liter. Cool to room temperature.

PREPARATION OF SAMPLE: Maintain samples in refrigerated storage at temperatures of 0° F. or lower. Remove individual fish-stick samples only as immediately needed for the analysis.

Determination:

1. Remove the frozen fish stick from the refrigerated storage and weigh the fish stick to the nearest 0.1 gram immediately (within 20 seconds). Do not use broken or damaged fish sticks or those with large voids in the coating.

2. Employing the clip tongs, promptly immerse the fish stick into the copper-sulfate solution for the appropriate time specified (table 1). Allow the tongs to remain attached to the fish stick (fig. 1) to avoid delay in the subsequent removal of the fish stick from the solution.




3. At the end of the interval specified in table 1, promptly remove the fish stick from the solution, roll the stick lightly in a paper towel, press the towel lightly against the stick on all sides to absorb excess moisture, and then unroll the towel. The rolling, pressing, and unrolling should be completed in not more than 7 seconds.

Table 1 - Dipping-Time Guide

| Temperature of the Copper-Sulfate Solution | Temperature of the Frozen Fried Fish Sticks | | Dipping Time | |
|---|---|---|---|---|
| | | | Fish Sticks Fried in Nonhydrogenated Oils | Fish Sticks Fried in Hydrogenated or Hardened Oils 2/ |
| | Degree F. | Degree C. | (Seconds) | |
| Room Temperature 1/ (65° to 85° F.) | 0 to -10 | -18 to -23 | 20 to 25 | 25 to 30 |
| | -10 to -15 | -23 to -26 | 20 to 25 | 30 to 40 |
| | -15 to -20 | -26 to -29 | 25 to 30 | 35 to 45 |
| | -20 to -30 | -29 to -34 | 30 to 35 | 45 to 60 |

1/ The exact temperature, within this range, was found not to be critical.

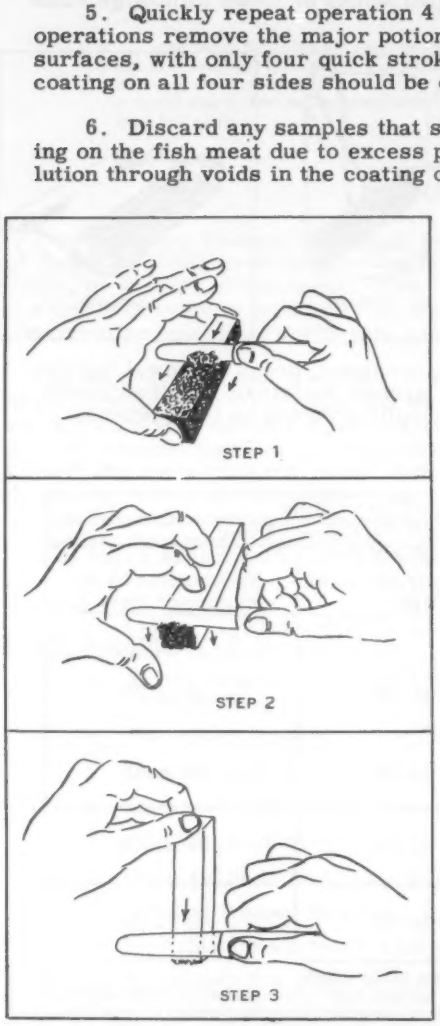
2/ A crude method for determining whether a fish stick has been fried in hydrogenated or hardened fats is as follows: Remove a small portion of the coating from one stick. Place the material in a test tube, add several ml. of ether or acetone, and shake lightly. Decant a portion of the solvent solution onto a piece of paper towel. Hydrogenated or hardened fats leave a white solid spot on the paper after the solvent has evaporated.

4. Under adequate lighting, remove the coating from the top side of the fish stick. To do this (a) grasp the fish stick (which is lying flat on the towel) by the ends (fig. 2, step 1); (b) place the spatula on the top surface of the fish stick at the end that is away from the operator and press the spatula into the coating perpendicular to the surface, being careful not to penetrate the meat of the fish stick; and (c) quickly draw the spatula blade

over the fish stick in one long continuous motion, removing the coating. The fibrous-appearing fish meat should remain, whereas the yellow coating should roll off.

5. Quickly repeat operation 4 on the three remaining sides. These operations remove the major potion of the coating from the four principal surfaces, with only four quick strokes. This phase of the removal of the coating on all four sides should be completed within 20 seconds.

6. Discard any samples that show more than a trace of blue coloring on the fish meat due to excess penetration of the copper sulfate solution through voids in the coating of the fish stick.




7. Remove the coating from the two ends of the fish stick. To do this, hold the blade of the spatula at and parallel to the end, and cut away the coating (fig. 2, step 2).

8. Remove from the still-frozen fish stick any remaining coating, which appears as a yellow film, by use of the rounded tip of the spatula. Scrape the fish lightly, taking care to scrape only those surfaces where the film remains.

9. Remove any coating on the edges by holding the fish stick upright and cutting away the coating with the blade of the spatula being held almost parallel to the edge of the fish stick (fig. 2, step 3).

10. Weigh the fish meat remaining.

11. Calculate the amount of fish meat by use of the formula:

$$\text{Percent fish meat} = \frac{(\text{weight of fish meat})\ 100}{(\text{weight of whole stick})}$$

## DISCUSSION

The weighings and the removal of the coating should be carried out as rapidly as is compatible with good care. The following precautions should be observed:

1. The total elapsed time for analysis of each fish stick should not exceed $3\frac{1}{2}$ minutes. A period of time greater than this may (a) permit errors resulting from the condensation of moisture on the fish stick or loss of water from the fish into the coating and (b) by allowing the fish stick to thaw or soften, make it difficult to scrape off the coating without removing some of the fish meat.

2. Care should be taken to scape only those portions of the fish stick where the coating remains and not to rescrape any exposed portion of the fish meat.

3. Any samples showing excessive penetration of the dipping solution (more than a trace of blue coloring on the fish meat) should be discarded. The speed of penetration through the coating to the surface of the fish meat depends upon (a) the temperature of the fish stick and (b) the thickness and consistency of the coating. The exact dipping time therefore should be adjusted for the particular product, within the ranges specified, by experimentation. For control testing of the same commercial production of fish sticks, plain water may be substituted for the copper-sulfate solution, once the dipping time has been standardized for the particular product. The copper-sulfate solution can be used over and over, provided it is clarified by filtration through filter paper, glass wool, or paper towel.

4. Copper sulfate is a poison. Hence the discarded fish sticks should not be recoated or be used to feed animals.

Note: The author gratefully acknowledges the aid of Mr. Boris O. Knake who drew the illustrations.

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LITERATURE CITED

1956. Federal Register, July 21, pp. 5475-5477-9. Part 52--Processed Fruits and Vegetables, Processed Products thereof and certain other Food Products. Subpart-United States Standards for Grades of Frozen Fried Fish Sticks.

## RAISING OF SHRIMP

The success of an enterprise to raise shrimp would depend, among other things, upon proper preparation of nursery and rearing ponds. One kind of shrimp known scientifically as Penaeus monodon Fabricus, has been cultivated in Philippine estuarine ponds with an average production of 280 pounds per acre over a period of six months.

The shrimp are caught by dip nets when about one half inch long, and then placed in the nursery ponds about 20 square yards in size. These nurseries must be cleaned of predators, such as fish and crabs, and have a flow of tidal water. The water depth is kept at about $1\frac{1}{2}$ to 4 inches. Screens prevent escape of the small shrimp and the entrance of predators.

The larger rearing ponds are drained and cleaned before planting the shrimp from the nursery ponds. They are usually about 1 to 3 acres in size.

To raise shrimp in Florida would meet with specific problems. Conditions are such that while possible it is not believed to be generally practical to attempt such an enterprise.

--Sea Secrets, The Marine Laboratory, University of Marine, Coral Gables, Fla.

## Animal Foods

MANUFACTURERS ORGANIZED: The American Pet Food Manufacturers, a division of American Feed Manufacturers Association, was organized during a meeting in Chicago in September 1956. This organization is of special interest to the fishing industry since it acts as a spokesman for the pet-food manufacturers, and supplies technical advice to its members.

The Pet Food Research Committee consists of chairman Dr. John W. Bernotavicz, Gaines Division, General Foods Corporation, Kankakee, Ill.; vice chairman H. C. Schaefer, Ralston Purina Co., St. Louis; Dr. Paul R. Record, Security Mills, Knoxville, Tenn.; Dr. Victor Heiman, Kasco Mills, Inc., Waverly, N. Y.; Dr. J. E. Hunter, Allied Mills, Inc., Libertyville, Ill.; Dr. E. M. Gildow, Carnation Milk Farms, Carnation, Wash.; Dr. John A. Pinkos, the Quaker Oats Co., Rockford, Ill.; and Dr. W. J. Monson, the Borden Co., Elgin, Ill.

The Research Committee aids in interpretation and distributing to its members and the general public the data obtained from industry-sponsored research conducted at the University of Wisconsin, Madison. It also evaluates and publishes abstracts of scientific articles on dog nutrition as published in a number of technical journals.

The Research Committee is an excellent contact for dependable information by the members of the fishing industry which are interested in finding new outlets for raw, semiprocessed, or processed fishery products in pet foods.

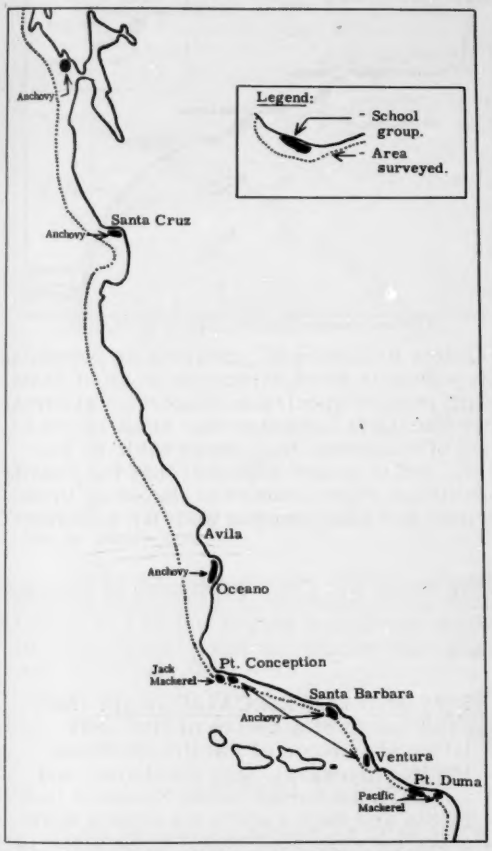
## Cans--Shipments for Fishery Products, January-September 1956

Total shipments of metal cans during January-September 1956 amounted to 86,019 short tons of steel (based on the amount of steel consumed in the manufacture of cans) as compared with 74,848 tons in the same period of 1955. The peak season for packing some important fishery products usually ends on or before September. The 1956 pack of important items such as Maine sardines, Pacific salmon, and tuna will exceed those for 1955.

Note: Statistics cover all commercial and captive plants known to be producing metal cans. Reported in base boxes of steel consumed in the manufacture of cans, the data for fishery products are converted to tons of steel by using the factor: 23.0 base boxes of steel equal one short ton of steel.

## California

PELAGIC FISH DISTRIBUTION, ABUNDANCE, AND BEHAVIOR STUDIED BETWEEN BODEGA BAY AND SAN DIEGO (Airplane Spotting Flight 56-9): In order to study pelagic fish distribution, abundance, and behavior off Southern California, an airplane spotting flight was made by the California Department of Fish and Game Cessna (1359D) airplane between October 27-29 1956. This flight followed immediately upon a period of stormy weather. As heavy swells and winds were encountered over most of the area north of Pt. Vicente, the observations made north of this point may not be true indications of the amount of fish present. It is known that fish schools tend to disappear during windy periods, especially the mackerels.




Airplane spotting flight 56-9 (Oct. 27-28, 1956).

Sardines continued scarce but Pacific mackerel continued more abundant than in the previous season. Anchovies were much less abundant than in September throughout the entire coastal area.

Anchovy: The large concentration of anchovies observed off Avila and Oceano in September remains the largest school group in central California. Over 100 schools were seen in this area in September but only 18 schools were seen during this flight. This decrease in abundance may be due in part to stormy seas but it may also be due to the seasonal fluctuation in abundance as exhibited by anchovies in the past. Over the past three seasons there has been a build-up of anchovy stocks in the inshore area in early spring with a peak of abundance from May-August followed by a breaking up of concentrations in October and November.

A tally indicates that 114 anchovy schools and 462,000 square feet of total area of fish were tallied in each 10-mile section of the coast from San Francisco to La Jolla in which anchovies were found.

Sardine and Pacific Mackerel: No schools of pure sardines were seen during this flight. Commercial aerial spotters found sardine schools at the surface at night but failed to find any during the daytime. Pacific mackerel schools were visible in the daytime and commercial catch sampling revealed that many of the Pacific mackerel schools contained varying amounts of sardines. Pacific mackerel schools were less in abundance during this flight than in September but then continue to be well scattered along the coast and in fair numbers.

Jack Mackerel: Three large schools of jack mackerel were seen near Pt. Conception. It was reported that a large concentration of mixed jack mackerel and Pacific mackerel were near Pt. Mugu but these were not observed, due possibly to the strong winds blowing in this area when scouted.

* * * * *

AIR SURVEY OF PELAGIC FISH DISTRIBUTION (Flight 56-10): Anchovy schools were found to be plentiful by the California Department of Fish and Game during flights by its Cessna 1359D (November 28-30, 1956) over the inshore area between Avila and San Diego. Schools of sardine and both Pacific and jack mackerel, observable from the airplane, were absent from this area during the period of the flight. However, it was known from other sources that schools of these three species were present off the Southern California coast at the time of the flight and it is assumed that these schools were below the surface during the daytime flights or outside the range of the survey area. Five schools of unidentified small fish were observed about two miles north of Avila.

Airplane spotting flight 56-10 (Nov. 28-30, 1956).

During the course of the flights 630 schools of anchovies were observed from Goleta to Coronado, covering an estimated 8.5 million square feet of surface. Anchovy schools were numerous south of Santa Barbara and continue to be the most abundant pelagic species in southern California. Due to exceptionally calm and clear weather excellent coverage was made of the inshore area. The distribution and abundance of anchovies was comparable to that observed on the September 1956 flight (56-8), and it is now apparent that the results of the October 1956 flight (56-9) were probably not representative. Scouting in October was done during a period of strong winds and heavy swells and fish apparently school deeper during this weather.

No anchovy schools were observed in the Avila-Pt. Conception area of the coast on this flight.

* * * * *

PELAGIC FISH SURVEYS OFF SOUTHERN AND LOWER CALIFORNIA (M/V N. B. Scofield, Cruises 6 and 7): The third and fourth of a series of five 1956 cruises for the purpose of assessing the relative abundance of Pacific sardines, Pacific mackerel, jack mackerel, and northern anchovies of the Southern California and Baja California coasts were made between September 25-October 13 (cruise 6) and October 25-November 12, 1956 (cruise 7) by the California Department of Fish and Game research vessel M/V N. B. Scofield.

Pelagic fish survey by M/V N. B. Scofield (Cruise 56-S-7, Oct. 25-Nov. 12, 1956).

Results of Cruise 6: A total of 96 light stations were occupied. Sardines were taken under the light at 3 stations, Pacific mackerel at 16, jack mackerel at 15, and anchovies at 7. In addition to the samples collected, Pacific mackerel were observed under the light but could not be taken at 3 stations, jack mackerel at 5, and anchovies at 1.

The vessel traveled 530 miles scouting for fish; 67 schools of sardines were

observed, 82 Pacific mackerel, 12 anchovy, and 13 schools of sauries. A total of 116 unidentified schools were observed. Of those it was felt that the majority were jack or Pacific mackerel.

Sea surface temperatures during the cruise ranged from 13.12° C. (55.6° F.) near Pt. Conception to 20.74° C. (69.3° F.) at Del Mar. Sardines were taken in waters with a temperature range of 16.89° C. (62.4° F.) to 17.72° C. (63.9° F.)

Pelagic fish survey by M/V N. B. Scofield (Cruise 56-5-6, Sept. 25- Oct. 12, 1956).

Results of Cruise 7: A total of 66 light stations were occupied, of which 1 yielded sardines, 6 northern anchovies, 3 Pacific mackerel, and 3 jack mackerel.

The vessel scouted 392 nautical miles, 98 schools of fish were visually observed, of which 15 were sardine, 36 northern anchovy, 4 mackerel, and 43 unidentified. The sardines were most abundant in Santa Monica Bay and the Santa Cruz Island area.

Rockfish specimens were taken by hook and line at Anacapa Island, Santa Cruz Island, Catalina Island, San Clemente Island, La Jolla, and Cortez Banks. A total of 113 specimens representing 16 species were taken.

Surface temperatures and bathythermograph casts were taken at all stations. Surface temperatures throughout the cruise ranged from a minimum of 12.50° C. (54.5° F.) at San Miguel Island to a maximum of 16.68° C. (62.1° F.) at Avalon Harbor, Santa Catalina. The surface temperature at which sardines were sampled was 14.50° C. (58° F.)

## Federal Purchases of Fishery Products

VETERANS ADMINISTRATION INCREASES USE OF FROZEN FISH FILLETS: Veterans Administration will increase the use of frozen fish fillets in its 173 hospitals in the nation by 330,000 pounds a year at an estimated cost of $132,000 that Agency's Area Medical Director at Boston reported in mid-December. Only domestically-produced fillets will be bought.

The extra usage is expected to result from more frequent offerings of fillets on selective menus which give hospital patients a choice of food.

Last year (fiscal 1956), nearly three million pounds of fish and other sea foods costing more than $1,000,000 were consumed by VA's average daily patient load of about 110,000 veterans. Supply officers in VA hospitals purchase all fish locally on an open-market purchase.

It is estimated that about 60 percent of last year's consumption was fresh and frozen fish, mostly the latter.

The extended use of selective menus is changing food patterns, in that foods formerly considered unpopular with a majority of the patients frequently are chosen when offered as an alternate to traditionally popular items.

* * * * *

FRESH AND FROZEN FISHERY PRODUCTS PURCHASED BY THE DEPARTMENT OF DEFENSE, OCTOBER 1956: A total of 2,182,329 pounds (valued at $1,097,720) of fresh and frozen fishery products for the use of the Army, Navy, Marine Corps, and Air Force were purchased in October 1956 by the Military Subsistence Supply Agency. This was an increase of 11.5 percent in quantity and 10.1 percent in value as compared with the previous month. When compared with October 1955, purchases were higher by 9.3 percent in quantity and 25.3 percent in value.

For the first 10 months of 1956 purchases totaled 22,416,612 pounds, valued at $11,202,529--an increase of 5.5 percent in quantity and 22.1 percent in value.

Prices paid for fresh and frozen fishery products by the Department of Defense in October averaged 50.3 cents a pound, lower by 0.6 cents than the 50.9 cents paid in the previous month, but higher by 6.4 cents than the October 1955 price.

In addition to the purchases of fresh and frozen fishery products reported, the Armed Forces generally make some local purchases which are not included in the data given above. Therefore, actual purchases are somewhat higher than indicated, but it is not possible to obtain data on local purchases made by military installations throughout the country.

## Fisheries Loan Fund

APPROVAL OF FIRST LOANS ANNOUNCED: The first five loans to be granted from the new Fisheries Loan Fund have been approved by the United States Fish and Wildlife Service, the Secretary of the Interior announced on December 28, 1956.

One of these loans is to an applicant in Massachusetts, two are to California applicants, and two to Alaska fishermen. The loans will be "official" when the applicants sign the terms set forth in the loan agreement. The loans will be closed and serviced for the Department of the Interior by the Small Business Administration.

The total of the five loans is $41,500. Other applications are in the final stages of processing. On file and being handled as rapidly as possible are approximately 70 other valid applications totaling $2,300,000.

The Fisheries Loan Fund was established by the Fish and Wildlife Act of 1956, approved by the President on August 8, "to make loans for financing and refinancing of operations, maintenance, replacement or repair of fishing gear and vessels, and for research into the basic problems of fisheries." Applications for shore installations or needs other than those set forth above are not eligible.

The loan applications are well distributed over the country. From New England have come applications for $919,500; from the West Coast there are requests for $960,000. Gulf fishermen are seeking $274,000; those of the Middle and South Atlantic $48,000; Alaskans are requesting $72,500; and Great Lakes fishermen are asking $40,300.

The broad objective of the fisheries loan fund is to provide financial assistance which will aid the commercial fishing industry to bring about a general upgrading of the condition of both vessels and fishing gear in order to produce more efficient and profitable fishing operations.

The initial $10 million provided by the 1956 act is a revolving fund. The rate of interest on all loans granted is at present fixed at five percent a year. The period of maturity of any loan shall be determined and fixed according to circumstances, but in no case can it exceed a period of 10 years.

## Florida

FISHERIES RESEARCH, JULY-SEPTEMBER 1956: The following are some excerpts from the Quarterly Report on Fisheries Research, September 1956, of the Marine Laboratory of the University of Miami.

Mullet Marketing Survey: The mullet marketing study, a joint project of the Florida State Board of Conservation and the U. S. Fish and Wildlife Service, was completed and a report submitted. The brief summary accompanying the report points out:

"Recommendations presented in this report involve active cooperation between industry, state, and Federal governments. No direct subsidies are recommended at either the Federal or state level, but legislative action in certain fields is recommended at the state level, and assistance in the form of technological and marketing aid is recommended to the industry from the state and Federal governments.

"The depressed condition of certain segments of the Florida fishing industry was found to be intimately associated with the fortunes of the mullet fishery, which therefore received the major attention in this study.

"It was found that the source of a great part of the United States supply of edible food fish has shifted since World War II. So have the methods of preparation and the methods of marketing. These technological advances and marketing innovations have been the answer of the fishing industry to the demands of an increasing population and greater national prosperity. It is believed that the Florida fisheries have not gone as far as others in this progress and that their markets have suffered as a consequence."

Small Shrimp Studies: During July, August, and September 1956, trips were made on the M/V Manboy to the Tortugas shrimp fishing grounds and the regular sampling of the escapement of small shrimp through the cod end of varying mesh sizes was continued. The September trip concluded the contract with this vessel and data have now been gathered throughout one year. These are being processed and a report is being prepared covering this project. A recommendation was made to the State Board of Conservation that if regulations are imposed to restrict the capture of small shrimp, the best regulation at present seems to be a minimum mesh size of 2¼".

The U. S. Fish and Wildlife Service took two scientists of the Marine Laboratory aboard its M/V George M. Bowers to make observations on catches from the Tortugas fishery. During this cruise a study was made on the effect on small pink shrimp of passing through the meshes of a trawl. A tank on the vessel's deck supplied with fresh sea water made it possible to observe the shrimp for an extended period of time. It is already possible to report that it appears likely that nearly all shrimp survive the passage through the net, thus removing a possible flaw in this type of regulation.

An analysis of the Tortugas pink shrimp fishery has been commenced. This analysis should provide information on the trends in abundance from the beginning of the fishery in 1950 to the present, upon which intelligent regulations can be based to provide maximum sustained yield.

Spoilage Control in Shrimp: Studies were begun to determine the preservative action on shrimp of aureomycin ices prepared with three different stabilizers. Results from the tests indicate that carrageenin is the best stabilizer used in conjunction with aureomycin.

Studies of carrageenin-aureomycin ices are continuing and tests are currently under way to determine the effect on black spot development of aureomycin ice when prepared with a low calcium content carrageenin.

Fish Rancidity and Pigmentation Studies: Further tests were continued on the application of seven different antioxidants and sequestering agents to breaded mullet in the control of rancidity. Results from the tests run on mullet which had been frozen for a period of four months indicate that combinations of ionol with citric acid and carboxy-methylcellulose has a definite effect on the controlling of rancidity which would ordinarily have developed.

Taste panel scores on an experiment designed to determine the retarding effect of ionol on the development of rancidity when applied to fresh mackerel, in almost all cases indicated that the onset of rancidity had been retarded when compared to a

control of non-treated mackerel stored for the same length of time.

A series of tests were run using ionol to control the bleaching of defrosted or thawed red snappers. These tests have shown that the characteristic red pigment can be retained in samples treated with ionol after as long as a six months storage period. The controls, which had not been treated, showed bleaching.

## Food Irradiation Sterilization Site Chosen

The selection of Sharpe General Depot at Stockton, Calif., as the site of the U. S. Army Ionizing Radiation Center was announced jointly on November 9 by the Department of Defense and the Atomic Energy Commission. The center will investigate the use of ionizing radiation in the preservation of food.

The Army's Quartermaster Research and Development Command at Natick, Mass., will direct operations of the center. Work is expected to begin during the 1957 fiscal year and the center is expected to be in operation late in 1958.

"Initially," it was announced, "the center will have as its primary mission the development of methods of utilizing ionizing radiation to preserve foods and to determine the economic feasibility of such a process. The processing area will be designed so that a large variety of products may be handled and so that major modifications in processing lines may be effected.

"This aspect of the center's activities will be performed in conjunction with the Quartermaster Food and Container Institute, Chicago, which is conducting the overall Quartermaster Corps research and development program."

Note: See Commercial Fisheries Review, August 1956, p. 30.

## Great Lakes Fishery Investigations

BIOLOGICAL STUDIES OF FISH POPULATIONS IN SAGINAW BAY AND SOUTHERN LAKE HURON (M/V "Cisco," Cruise 8): The primary purpose of cruise 8 by the Service's M/V Cisco (October 23-November 5, 1956) was to investigate the fall distribution and spawning condition of fish populations in Saginaw Bay in southern Lake Huron. Gill nets (1-, $1\frac{1}{2}$-, 2-, $2\frac{1}{4}$-, $2\frac{1}{2}$-, $2\frac{3}{4}$-, 3-, and 4-inch) were set on the bottom off Sand Point, Charity Island, and Fish Point in Saginaw Bay, and in 25 fathoms and 50 fathoms in southern Lake Huron between Harbor Beach and Goderich. Oblique gill-net sets were made off East Tawas in 13 and 26 fathoms and a bull net (300 feet long, 120 meshes deep) was set in 26 fathoms off East Tawas.

Bloaters (Leuchichthys hoyi) made up a considerably larger percentage of the catch of the 50-fathom set in Lake Huron than was the case during the summer. The bloaters were for the most part small. Long jaws (L. alpenae), L. kiyi, and a few L. reighardi were also taken in this set. The bulk of the fall-spawning longjaws and L. kiyi were still not ripe, although a very few of the longjaws had completed their spawning. The catch in the 25-fathom set was larger than that of the deeper set and was predominately bloaters (366 of this species). There were also 6 L. reighardi; 1 lake herring (L. artedi) and 68 smelt (Osmerus mordax). This latter species appears to move out into deeper water in late summer and fall.

The catches in Saginaw Bay were generally light, although a large catch of small perch (Perca flavescens) was made in the small mesh off Fish Point. Four walleyes (Stizostedion vitreum vitreum) were caught off Sand Point, 27 off Charity Island, and one off Fish Point. Sixteen of them were tagged and released. Other species taken in the bottom sets were herring, white suckers (Catostomus commersoni), white

bass (Lepibema chrysops), carp (Cyprinus carpio), stonecat (Noturus flavus), sauger (Stitzostedion canalense), and smelt. Only one smelt was caught. Apparently there are relatively few adult smelt in the Bay at the present time.

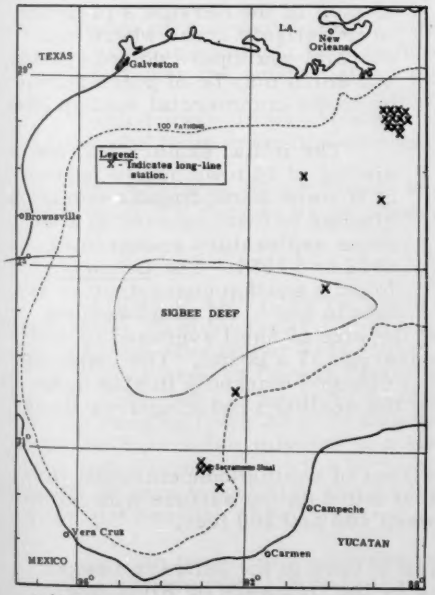
The 13-fathom oblique nets took only one fish, a herring, and the oblique set in 26 fathoms caught several bloaters, longjaws, smelt, and 2 herring. The herring were near the surface, while the other fish were scattered from 13 fathoms beneath the surface to the bottom. The bull net, which was set so that its float line was 110 feet beneath the surface, caught 9 herring, 13 longjaws, 54 bloaters, 2 L. kiyi, and 55 smelt. Although the gill net catches indicate that the herring have begun to move into Saginaw Bay for spawning, none of them was found to be in a spawning condition.

Trawling tows were made off East Tawas in from 7 to 10 fathoms. The catches were practically all smelt fry and alewife (Pomolobus pseudoharengus) fry. Approximately 10,000 alewives ranging in size from 2 to $3\frac{1}{2}$ inches were taken in one 12-minute tow at 7 fathoms.

Hydrographic transects were run from Bay City to East Tawas, East Tawas to Harbor Beach, Harbor Beach to Goderich, East Tawas to Oak Point, and Hat Point to Au Sable Point. The latter two transects were made as part of a synoptic study that was carried out in cooperation with the Michigan Conservation Department.

Due to continued unseasonably warm weather, surface water temperatures showed practically no decline during the cruise. Temperatures were mostly 11-12° C. (51.8-53.6° F.), with extremes ranging from 7.0° C. (44.6° F.) to about 13° C. (55.4° F.), except near the mouth of the Saginaw River where the water was considerably warmer.

## Gulf Exploratory Fishery Program



M/V Oregon cruise 41 (Nov.16-Dec. 13, 1956).

GOOD CATCH OF YELLOWFIN TUNA MADE IN GULF (M/V Oregon, Cruise 41): Thirty-five tons of yellowfin tuna were caught in the Gulf of Mexico on 20 sets of long-line gear, during cruise 41 of the Service's exploratory fishing vessel Oregon (November 4-December 13, 1956). The sets averaged 67 baskets (670 hooks) each.

The cruise was divided into two sections. From November 16-30, 10 sets were made between the Mississippi Delta and the Gulf of Campeche. Highest catch rates were found in the Mississippi Delta area (6.6 yellowfin/100 hooks) and west of Sacramento Shoal in the Gulf of Campeche (3.7 to 8.6 yellowfin/100 hooks). Through the central Gulf, catch rates varied from 0.2 to 1.3 yellowfin tuna/100 hooks. The average weight of yellowfin in the Campeche area was 76 pounds, compared to an average weight of 123 pounds in the northern Gulf.

During December 3-13, 10 sets were made in an area 30 to 40 miles southeast of South Pass. Catch rates varied from 3.7 to 8.6

yellowfin/100 hooks, and during the first seven days over 25 tons were landed.

The yellowfin tuna ranged in weight from 15 to 185 pounds, and averaged 116 pounds each for the entire trip; 12 percent of the 603 yellowfin caught were damaged to some extent by sharks. The remaining whole yellowfin weighed 61,844 pounds.

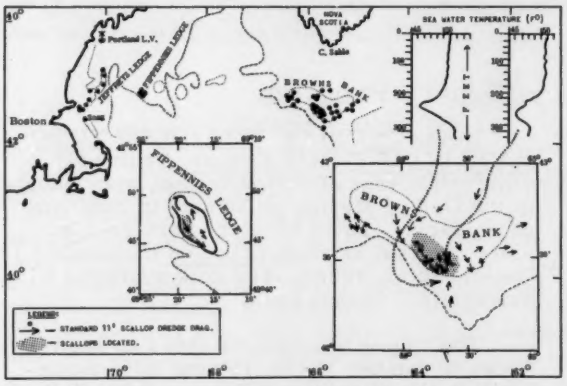
In addition, 9 broadbill swordfish (1,330 pounds), 11 white skipjack, 7 blackfin tuna, 35 white marlin, 4 blue marlin, 14 wahoo, and 107 sharks (5 species) were caught on the long lines. Three white marlin and two blue marlin were tagged and released.

Menhaden and croakers were used as bait. Catch rates on the menhaden were 4.4 yellowfin/100 hooks, compared to 1.7/100 hooks for croakers.

Large surface schools of mixed blackfin tuna and white skipjack were observed daily throught the cruise. During the early morning hours of December 11, large surface schools of spawning mullet were observed under the dip-netting lights, at lat. 28°25' N., long. 88°44' N. in over 750 fathoms.

## North Atlantic Fisheries Exploration and Gear Research

SCALLOP BEDS FOUND ON BROWNS BANK (M/V Delaware, Cruise 28): The first exploratory cruise for new scallop grounds was made by the Service's research trawler Delaware during a trip to Browns Bank that ended November 27, 1956. It was discovered that Brown's Bank supported a sizable population of small sea scallops. The cruise was made as part of the Service's program to investigate areas where commercial scallopers do not operate, but which may be of potential value to the commercial scallop fleet.




M/V Delaware cruise 28, Nov. 13-21 and Nov. 23-27, 1956

The initial exploration, consisting of 38 tows over a portion of Browns Bank, found a condition similar to that reported by Canadian exploratory research in 1953 and 1954. The Delaware found a scallop concentration exists in one area, as 15 bushels were taken during one 40-minute tow. However, the size of shell averaged $3\frac{3}{4}$" and the yield of scallop "eyes" (meats) was found to average 57 a pound. The condition of the scallop stocks in this area evidently has not changed markedly in size composition during the past two years. Tows outside the scallop-producing area many times resulted in extensive gear damage.

Two casts with the Bathythermograph in the area of scallop concentration indicated a bottom water temperature similar to that found on the surface with an intrusion of 5° F. cooler water over the area between 180 and 260 feet.

The second phase of the exploration consisted of tows in the Jeffreys Ledge and Fippennies Ledge areas. One 20-minute tow by the Delaware on Fippennies

yielded 75 scallops of 4½" and 5" size with 37 eyes a pound. Heavy weather hampered operations all during the second phase and prohibited any further exploration in this area for its commercial potential.

## North Atlantic Fisheries Investigations

YOUNG FISH DISTRIBUTION SURVEYED BY "ALBATROSS III" (Cruises 81 and 82): During the course of two cruises (November 2-10 and November 13-21, 1956), the Service's research vessel Albatross III made 94 trawl tows in New England waters--65 in the Gulf of Maine, and 29 in the offing of southern New England, Long Island, and New Jersey. Operation was favored by unusually good weather conditions for the time of year.

The objectives were to determine the distribution and number of young-of-the year and older demersal fish in New England waters and to undertake special studies on haddock, whiting, sea herring, and red hake (ling) concerned with the distribution of stocks, food habits, and age and growth; to conduct high-frequency ground wave propagation studies relative to future work with telebouys and transponding units which will be used to transmit data on ocean conditions to receiving units ashore.

Census work on bottom fish populations and invertebrate life was successfully carried out and hydrographic data collected. Ground wave propagation transmissions were made when time permitted.

Principal species caught in the Gulf of Maine were haddock, whiting, ocean perch, fluke, red hake, skates, and dogfish in addition to over 25 other species. In the offing of southern New England whiting, butterfish, red hake, and dogfish dominated the tows.

Young-of-the-year haddock were found largely in the Gulf of Maine and were very scarce in southern New England waters. Young-of-the-year whiting were numerous over the entire fishery especially at depths between 20 and 40 fathoms.

Ground-wave propagation studies so far show a workable range of 40 miles can be expected from operation on a carrier frequency of 28,100 kilocycles.

The Albatross III left Woods Hole on November 27 for three days to test an underwater TV camera as an observation device in trawl nets.

* * * * *

HADDOCK AND COD TAGGED ON GEORGES BANK (M/V Albatross III, Cruise 84): Over 80 otter-trawl caught cod and haddock were tagged on Georges Bank during a cruise (December 6-14, 1956) by the Service's research vessel Albatross III. The tagging area on Georges Bank was north of 41°20' N. latitude and east of 67° 40' W. longitude. Twenty-eight tows, mostly of one hour duration, were made in depths ranging from 20 to 60 fathoms. The catch was culled and specimens chosen were held for a few minutes in a large tank of running sea water at about 50° F. Only fish which appeared to be lively were tagged, and records were kept of the length of each tagged fish and its apparent condition on release. Two working days were lost because of bad weather.

The fish tagged and released included 698 haddock, 30-64 cm., yellow Petersen disc on left opercle; 113 cod, 31-115 cm., yellow Lea tag anchored by plastic strip inserted in coelom; 1 halibut, 110 cm., tagged like cod.

## Oregon

TROLL-CAUGHT SALMON LANDINGS FOR 1956: The landings of troll-caught chinook or king salmon in Oregon in 1956 were the highest recorded since 1922, according to a December 19, 1956, news release by the Fish Commission of Oregon.

The high chinook salmon troll catch of approximately 4 million pounds was made even though the season opening was delayed 30 days last spring. Chinook trolling off the Colunbia river was considered only fair this year, but landings at other Oregon coastal areas were up considerably from previous years.

Silver or coho salmon landings by trollers at Oregon ports in 1956 totaled more than 3 million pounds, which was considered good but not exceptional. Silver salmon troll catches through August this year were higher than the five-year average for the period, but lighter landings were made in September and October 1956, probably due to the switch from salmon fishing to albacore tuna fishing by many boats late in the season.

The Fish Commission biologist in charge of troll salmon studies said the later troll season opening in 1956 was adopted to give added protection to declining fall chinook salmon runs in the Columbia River. Previous fish tagging and fin-marking experiments have indicated that Columbia River fall chinook are concentrated between Grays Harbor and the mouth of the Columbia in early spring and are fished heavily during the first part of the trolling season.

The biologist stated that the delayed opening of the troll season resulted in increased spawning escapements of fall chinook salmon to hatcheries and natural spawning areas in the lower Columbia system in 1956. More stringent restrictions on gill-net fishing in the Columbia were also considered a factor in the increased fall Chinook escapements.

Sampling of troll catches was continued by the Fish Commission this year with examination of 147,000 chinook and salver salmon, primarily at Astoria and Newport. During the season 100 fin-marked fish were observed in the catches sampled. Analysis of the marked fish recoveries will provide further information concerning survival and ocean migration of salmon and the percentage of fish caught in different areas along the coast.

## Oysters

FREE LIQUID STILL LIMITED TO 5 PERCENT BY WEIGHT: Regulations for the fresh shucked and canned oyster trade which were adopted by the National Conference of Weights and Measures at the annual meeting in Washington, D. C., the last week in May 1956 stated that:

The regulations for "Raw or Fresh Oysters" indicated that the "raw or fresh oysters in tins, glass, or other containers .... shall not contain more than 10 percent liquid ... ."

The U. S. Food and Drug Administration points out that there has been no change in the standards under the Federal Food, Drug, and Cosmetic Act which provide for a limit of only 5 percent free liquid by weight.

## Puget Sound Canned Salmon Pack, 1956

The total pack of canned salmon in the Puget Sound area of Washington amounted to about 278,000 standard cases (48 1-lb. cans), according to preliminary data compiled by the U. S. Fish and Wildlife Service.

Table 1 - Washington's Puget Sound Canned Salmon Pack 1952-56

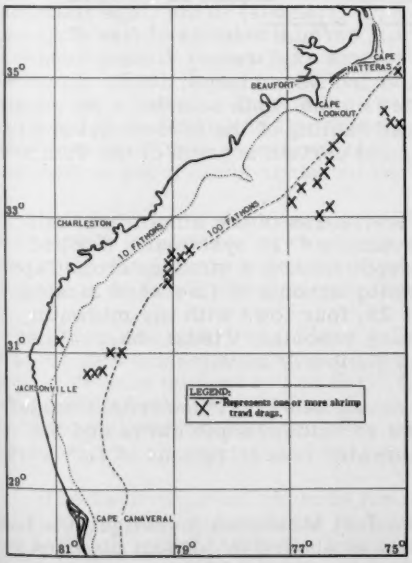
| Species | 1/1956 | 1955 | 1954 | 1953 | 1952 |
|---|---|---|---|---|---|
| | (Standard Cases 2/) | | | | |
| Red or sockeye | 115,111 | 121,913 | 579,575 | 216,984 | 214,540 |
| Chinook or king | 3,000 | 10,177 | 6,281 | 3,985 | 7,887 |
| Silver or coho | 72,000 | 73,526 | 33,596 | 54,943 | 173,238 |
| Pink | 8,000 | 436,280 | 14,059 | 452,054 | 4,711 |
| Chum or keta | 80,000 | 88,672 | 294,799 | 154,476 | 297,494 |
| Total | 278,000 | 730,568 | 928,310 | 882,442 | 697,870 |

1/ Preliminary estimates. 2/ 48 1-lb. cans.

The canned salmon pack includes 140,000 cases packed from Puget Sound-caught fish, 98,000 cases from Alaska-caught fish, and 40,000 cases from imported fish from British Columbia. The pack was much lower than anticipated due to a very poor run of chum salmon, both in Puget Sound and British Columbia and also because it was the off-year for pink salmon.

## South Atlantic Exploratory Fishery Program

ROYAL-RED SHRIMP DISTRIBUTION SURVEYS CONTINUED (M/V Combat, Cruise 6): The coastal area of the South Atlantic, between Florida and North Carolina, was surveyed for concentrations of royal-red shrimp in two trips (mid-October to mid-November 1956) by the Service's chartered vessel M/V Combat. The first trip in October was designed to obtain further information on the apparent dispersal of the royal-red shrimp following the passing of the hurricane in September.




Location of exploratory trawling stations by the M/V Combat during October-November 1956.

Catches in the St. Augustine area, where large concentrations were located, prior to the hurricane, contained only small numbers of shrimp. Seven drags with a 40-foot shrimp trawl in 180 to 200 fathoms resulted in catches of only 15 pounds of shrimp an hour or less.

In late October, trawling coverage extended southward, out to depths of 230 fathoms. On October 25, good fishing concentrations were located in 150-160 fathoms ENE. of Daytona Beach. Twenty-four hours of round-the-clock fishing yielded over 800 pounds (heads-on) shrimp. The trip was then discontinued due to depth-recorder trouble.

During October 31-November 19, the Combat carried out exploratory dragging off the coasts of Georgia, South Carolina, and North Carolina. Using a 40-foot trawl, night trawling off South Carolina in 23-25

fathoms caught large rock shrimp (Sicyonia sp.) at rates of 25 to 35 pounds an hour. Twelve drags in 18-50 fathoms in daytime failed to catch a single commercial shrimp.

Between Cape Hatteras, N. C., and Cape Fear, Fla., 15 drags were made in 125 to 250 fathoms. Two of these resulted in the loss of trawl and doors and

The shrimp vessel Combat chartered by the U. S. Fish and Wildlife Service for exploratory fishing in the South Atlantic waters between Florida and North Carolina.

several other drags severely damaged the trawls. Several species of deep-water shrimp were caught, but in very small numbers. Most abundant was the small (60 count, heads-off) Penaeopsis megalops, although the best catch contained only three pounds.

* * * * *

MIDWATER TRAWL TESTED ON MENHADEN (M/V George M. Bowers, Cruise 7-A): Midwater trawling for menhaden (Brevoortia tyrannus) in the Cape Hatteras area during November 1956 produced no fish. All surface schools of fish dispersed when trawling approaches were made by the Service's exploratory fishing vessel George M. Bowers during a 34-day cruise that ended December 4, 1956. No evidence of their subsurface scattering was detected on the depth sounder. Movie and still cameras were used to record the setting and hauling of the 40-foot nylon midwater trawl, the behavior of menhaden schools, and certain aspects of the commercial fleet's purse-seining operations.

This cruise attempted to determine the effectiveness of the single-boat midwater trawl in taking pelagic fish. Between November 7-11 systematic day and night scouting operations were conducted with depth sounders offshore from Cape Lookout to Cape Hatteras. No surface or midwater schools of fish were located. After the appearance of menhaden on November 23, four tows with the midwater trawl were unsuccessful when set on large surface schools. Visual observations of numerous menhaden schools revealed erratic southerly movement.

From November 29-December 3, scouting operations continued from Charleston, S. C., to Cape Canaveral, Fla., between the 15-fathom depth curve and the edge of the continental shelf. No surface or midwater concentrations of fish were observed.

A fisheries biologist from the Service's Beaufort Menhaden Investigations Laboratory cooperated in these field operations and was aboard to conduct plankton tows to determine the distribution of menhaden eggs and larval forms.

Considerable time was lost during the cruise due to bad weather.

The George M. Bowers was scheduled to depart Miami January 3, 1957, on a three-week cruise to the northeastern Gulf of Mexico waters of the continental shelf. Mission of the cruise was to continue experimental midwater trawling in joint operation with the U. S. Fish and Wildlife Service's exploratory fishing vessel Oregon based at Pascagoula, Miss.

## South Carolina

FISHERIES BIOLOGICAL RESEARCH PROGRESS, SEPTEMBER-DECEMBER 1956: Oyster Research: In October 1956 a small lot of seed oysters was shipped from Bears Bluff to the Chesapeake Biological Laboratory at Solomons, Md., thus continuing the cooperative study on seed oysters begun 6½ years ago. An ever-increasing need for seed oysters in the Chesapeake Bay region makes these cooperative studies more important, Progress Report No. 30 (September-December 1956) of the Bears Bluff Laboratories points out.

Closely allied to seed oyster studies are the investigations made during the quarter on the growth and mortality of young of-the-year oysters. Likewise, experiments on the use of a substitute cultch for setting of young oysters will prove useful to the development of a seed oyster industry in South Carolina.

Shrimp Research: Offshore exploratory fishing during the quarter added to the present knowledge of South Carolina's offshore fishing potential. However, no startling discoveries were made. The offshore research vessel T-19 made 43 experimental drags in depths up to 45 fathoms. Commercially-valuable species caught included rock shrimp (Sicyonia brevirostris), scup or porgy, vermillion snapper, sea bass or blackfish, fluke, large croaker, but no commercial shrimp in depths greater than 6 fathoms.

Previous experimental tows made by Bears Bluff research vessels pointed out that brown shrimp were making up the bulk of the catch in May through August 1956. The proportions began to shift by September when only 35 percent of the shrimp caught were brown. During the quarter the trend was completely reversed and in October, November, and December, white shrimp made up 95 percent of the catch. This presumably is a near-normal seasonal situation except that in previous years the shift in populations occurred earlier--even in August.

The increased abundance of white over brown shrimp during the quarter can be oversimply explained by two happenings: (1) the dispersal and disappearance at sea of the large brown shrimp after spawning in September and (2) the seaward migration of small white shrimp from inshore waters.

These white shrimp, if they follow the pattern of other years, will remain under the beaches until next spring. They consitute the residual stock from which next year's crop is derived. The South Carolina General Assembly, in March 1956, gave increased protection to these shrimp by extending the limits of the closed season for commercial shrimp fishing. The season is now closed from December 15 to March 15.

The Laboratories' records for the fourth quarter compared with the same period in previous years indicate that white shrimp were not as abundant. If overfishing is solely responsible for this indicated decline in the population of white shrimp, it then follows that the longer closed season should result in a more abundant crop next spring.

Crab Research: In October 1956, the biologist in charge of crab investigations for the Department of Research and Education of Maryland, came to Bears Bluff to study and measure South Carolina blue crabs. The trawler Constance and the Laboratories' research vessel T-19 secured the necessary crabs for measurement. Studying only the adult female crabs that had already reached their maximum growth, the biologist came up with the following tabulations: South Carolina crabs are 0.2 percent smaller than Delaware Bay crabs but 14.4 percent larger than those from New Jersey; 3 percent larger than Chesapeake Bay crabs; 4 percent larger than those of North Carolina; and 6.5 percent larger than Florida crabs.

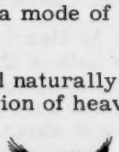
Salt Water Ponds: In late November an automatic flood gate in one experimental salt-water pond failed to close properly and due to near tides the pond water remained very low. Predation on the fish and shrimp in the pond by ducks (Mergansers) seemed heavier than usual, so this pond was completely drained on December 13.

A check-up on the shrimp and fish stocked on August 6, when last the pond was drained, showed that 5 of the 6 black drum (Pogonias cromis) were gone. The remaining one had apparently grown from 6.5 to 13 inches. All spot (Leiostomus xanthurus) were gone, as were all croaker (Micropogon undulatus). Some mullet (Mugil sp.) remained but 66.6 percent had disappeared. Those remaining showed little growth. More than 500 white shrimp (Penaeus setiferus) had been stocked in August, but now only one white shrimp was recaptured. This individual had grown about one inch in length--at least in December it measured one inch more than those of the largest shrimp stocked.

The leaking flood gate had not displaced the screens to the pond so that it is probable that the missing specimens did not escape but were either eaten by ducks or otters, or just died.

Some fish and shrimp had entered the pond since August 6. These, because of the screening, must have entered when quite small: 13 spotted shrimp (Penaeus duorarum) 4.5 inches in length; 17 winter sea trout (Cynoscion nebulosis) with a mode of 7 inches; and 5 mullet with a mode of 6 inches were harvested on December 13.

The total harvest of stocked and naturally-recruited specimens to the pond was small but the results give an indication of heavy mortality, much of which can be blamed on predation by water fowl.



## Transportation

RAIL FREIGHT AND EXPRESS RATE INCREASES GRANTED: Effective December 28, 1956, the Interstate Commerce Commission granted interim rail freight rate increases. The increases will be 5 percent within the West, 7 percent within the East, and 5 percent on traffic moving between the East, West, or South. No increases were granted for traffic moving wholly within the South, as the hearing on the Southern Railroad's request for a 7 percent increase is set for January 7, 1957.

Maximum increases were prescribed on several commodities, including a 7 cents a 100-lb. maximum on canned or preserved food products. No increase was prescribed for refrigeration or demurrage charges. The Commission also stated that it would expect the railroads to refund any difference between these increases and any lesser increases that may be prescribed as a result of the forthcoming investigation of the carriers' principal petition for a 15-percent increase in Ex Parte 206.

The Commission also decided not to suspend the Railway Express Agency's tariffs providing for a 4-percent increase in all express rates and charges, effective December 27, including reicing charges. The Eastern railroads' petition for a 15-percent increase in express rates within Eastern territory was still pending.

## United States Fishing Fleet[1/] Additions

A total of 30 fishing vessels of 5 net tons and over were issued first documents as fishing craft during November 1956, according to the U. S. Bureau of Customs.

Table 1 - U. S. Vessels Issued First Documents as Fishing Craft, by Areas, November 1956 and Comparisons

| Area | Nov. | | Jan.-Nov. | | Total |
|---|---|---|---|---|---|
| | 1956 | 1955 | 1956 | 1955 | 1955 |
| | (Number) | | | | |
| New England | - | 1 | 14 | 18 | 18 |
| Middle Atlantic | - | 1 | 23 | 13 | 13 |
| Chesapeake | 11 | 7 | 120 | 51 | 54 |
| South Atlantic | 5 | 3 | 111 | 64 | 65 |
| Gulf | 7 | 5 | 96 | 97 | 103 |
| Pacific | 3 | 2 | 74 | 112 | 117 |
| Great Lakes | 4 | 2 | 6 | 9 | 9 |
| Alaska | - | 4 | 40 | 35 | 35 |
| Hawaii | - | - | - | 3 | 3 |
| Virgin Islands | - | - | - | - | 1 |
| Total | 30 | 25 | 484 | 402 | 418 |

Note: Vessels assigned to the various sections on the basis of their home ports.

Table 2 - U. S. Vessels Issued First Documents as Fishing Craft, by Tonnage, November 1956

| Net Tons | Number |
|---|---|
| 5 to 9 | 17 |
| 10 to 19 | 7 |
| 20 to 29 | 3 |
| 30 to 39 | 1 |
| 40 to 49 | 1 |
| 100 to 109 | 1 |
| Total | 30 |

This was 5 vessels more than the number reported for the same period last year.

The Chesapeake area in November led with 11 newly-documented craft, followed by the Gulf with 7, the South Atlantic with 5, the Great Lakes with 4, and the Pacific with 3.

A total of 484 fishing vessels was documented for the first time during the first eleven months of 1956--an increase of 82 craft or 20 percent as compared with the corresponding period of a year earlier. During the first eleven months of 1956, Chesapeake led all other areas with 120 newly-documented vessels, followed by the South Atlantic area with 111.

1/Includes both commercial fishing and sport fishing craft.

## U. S. Foreign Trade

Table 1 - United States Foreign Trade in Edible Fishery Products, September 1956 With Comparisons

| Item | Quantity | | | Value | | |
|---|---|---|---|---|---|---|
| | Sept. | | Year | Sept. | | Year |
| | 1956 | 1955 | 1955 | 1956 | 1955 | 1955 |
| | (Millions of Lbs.) | | | (Millions of $) | | |
| Imports: | | | | | | |
| Fish and shellfish: | | | | | | |
| Fresh, frozen, & processed 1/ | 56.3 | 58.2 | 769.9 | 17.5 | 16.4 | 206.4 |
| Exports: | | | | | | |
| Processed 1/ only (excluding fresh & frozen) | 4.4 | 4.1 | 91.0 | 1.7 | 1.7 | 21.6 |

1/ Includes pastes, sauces, clam chowder and juice, and other specialties.

EDIBLE FISHERY PRODUCTS, SEPTEMBER 1956: Imports of edible fresh, frozen, and processed fish and shellfish in September decreased 24 percent in quantity and 21.9 percent in value as compared with August 1956. Compared with September 1955 the imports for September 1956 were lower by 3.3 percent in quantity, but were higher by 6.7 percent in value. September 1956 imports averaged 31.1 cents a pound as compared with 28.2 cents a pound for the same month in 1955.

Exports of processed fish and shellfish in September 1956 declined about 8 percent in quantity compared with the previous month, but were 8 percent above September 1955. The September 1956 value of these exports was 54.5 percent higher than the previous month, but was unchanged from September 1955 a year ago.

* * * * *

GROUNDFISH FILLET IMPORTS DECLINE IN NOVEMBER 1956: During November 1956, the United States imported a total of 5.7 million pounds of cod, haddock, hake, pollock, and ocean perch fillets and blocks. This was a decrease of 5.4 million pounds (49 percent) compared with imports during the same month in 1955. The decrease was due primarily to lower imports from Canada (down 1.5 million pounds).

Groundfish and ocean perch fillets received from Canada during November 1956 amounted to 5.0 million pounds or 87 percent of the total. The remaining 13 percent was received from Iceland, Denmark, the Netherlands, France, West Germany, and Greenland.

Eleven countries exported 134.4 million pounds of groundfish and ocean perch fillets to the United States during the first 11 months of 1956 as compared with 125.7 million pounds in 1955. Canada (96.3 million pounds) led all other countries with 72 percent of the 11-month total. Iceland (26.6 million pounds) was in second place, followed by Norway (3.9 million pounds), Denmark (3.0 million pounds), and West Germany (2.0 million pounds).

* * * * *

IMPORTS OF CANNED TUNA IN BRINE UNDER QUOTA PROVISO: The quantity of tuna canned in brine which may be imported into the United States during April 16 through December 31, 1956, at the $12\frac{1}{2}$-percent rate of duty is limited to 28,757,393 pounds. Any imports in excess of that quantity will be dutiable at 25 percent ad valorem.

Imports under the quota from April 16-December 1, 1956, amounted to 25,849,544 pounds, according to data compiled by the Bureau of the Customs. This leaves a balance of 2,907,849 pounds of the quota which may be imported in the last month of 1956 at the $12\frac{1}{2}$-percent rate of duty.

## Wholesale Prices, November 1956

Although some cold weather prevailed in some sections of the country during November 1956, conditions at sea were, on the average, more favorable to the fishermen than during the same month a year earlier. The catches in some of the major fisheries were better than past experience would indicate--particularly in the New England haddock and whiting fisheries, the Gulf shrimp fisheries, and the West Coast tuna fishery. The November 1956 wholesale price index (118.4 of the 1947-49 average) for all edible fish and shellfish (fresh, frozen, and canned), which took a step upward following a two-month downward trend, increased 5.2 percent over October and 5.7 percent over November 1955. The changes in the index from October to November 1956 were due primarily to higher wholesale prices for fresh and frozen shrimp and haddock.

The drawn, dressed, and whole finfish subgroup index for November increased by 4.5 percent when compared with October and 7.3 percent as compared with November 1955. The major change from October to November was an 81-percent

increase in the wholesale price for fresh drawn haddock at Boston. All the other varieties in this subgroup were priced lower when compared with the previous month. The downward movement of wholesale prices for halibut and salmon between October and November does not actually represent any change in the market for these species, but merely a shift in marketing and pricing frozen instead of fresh halibut and salmon. Fresh halibut and salmon were fairly scarce in October and practically disappeared from the market in November.

Because of higher prices for fresh headless shrimp at New York City and fresh haddock fillets at Boston, the November 1956 index for processed fish and shellfish increased 8.1 percent over October and 15.7 percent over the same month in 1955. Fresh haddock fillet prices in November were up 27.7 percent from October, but were lower by 4.2 percent when compared with November 1955. Fresh shrimp prices in November were also higher by 14.8 percent as compared with October and close to 28 percent higher than for November 1955. Fresh shucked oysters were unchanged from October but were up by about 9 percent from November 1955.

Table 1 - Wholesale Average Prices and Indexes for Edible Fish and Shellfish, October 1956 With Comparisons

| Group, Subgroup, and Item Specification | Point of Pricing | Unit | Avg. Prices1/ ($) | | Indexes (1947-49=100) | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Oct. 1956 | Sept. 1956 | Oct. 1956 | Sept. 1956 | Aug. 1956 | Sept. 1955 |
| ALL FISH & SHELLFISH (Fresh, Frozen, & Canned) | | | | | 112.5 | 114.3 | 114.6 | 107.4 |
| Fresh & Frozen Fishery Products: | | | | | 122.0 | 125.8 | 126.5 | 110.1 |
| Drawn, Dressed, or Whole Finfish: | | | | | 122.5 | 132.6 | 131.2 | 115.6 |
| Haddock, lge., offshore, drawn, fresh | Boston | lb. | .07 | .10 | 67.4 | 100.1 | 101.3 | 106.3 |
| Halibut, West., 20/80 lbs., drsd., fresh or froz. | New York | lb. | .43 | .45 | 135.5 | 139.2 | 136.9 | 99.3 |
| Salmon, king, lge. & med., drsd., fresh or froz. | New York | lb. | .67 | .68 | 150.6 | 151.7 | 148.3 | 135.1 |
| Whitefish,L. Superior, drawn, fresh | Chicago | lb. | .75 | .61 | 185.9 | 151.2 | 121.5 | 161.1 |
| Whitefish,L. Erie pound or gill net, rnd., fresh | New York | lb. | .80 | .74 | 161.8 | 149.6 | 131.4 | 161.7 |
| Lake trout, domestic, No. 1, drawn, fresh | Chicago | lb. | .75 | .58 | 153.6 | 117.8 | 122.9 | 116.8 |
| Yellow pike, L. Michigan&Huron, rnd., fresh | New York | lb. | .36 | .50 | 83.3 | 117.3 | 129.0 | 75.1 |
| Processed, Fresh (Fish & Shellfish): | | | | | 125.4 | 126.3 | 122.2 | 108.9 |
| Fillets, haddock, sml., skins on, 20-lb. tins | Boston | lb. | .27 | .29 | 91.9 | 97.0 | 97.0 | 102.1 |
| Shrimp, lge. (26-30 count), headless, fresh | New York | lb. | .71 | .72 | 112.2 | 113.0 | 110.2 | 87.1 |
| Oysters, shucked, standards | Norfolk | gal. | 6.00 | 6.00 | 148.5 | 148.5 | 142.3 | 136.1 |
| Processed, Frozen (Fish & Shellfish): | | | | | 106.2 | 102.9 | 114.5 | 93.3 |
| Fillets: Flounder, skinless, 1-lb. pkg. | Boston | lb. | .39 | .40 | 102.1 | 103.4 | 103.4 | 102.1 |
| Haddock, sml.,skins on, 1-lb. pkg. | Boston | lb. | .28 | .28 | 86.3 | 86.3 | 86.3 | 84.7 |
| Ocean perch, skins on, 1-lb. pkg. | Boston | lb. | .27 | .28 | 108.8 | 110.8 | 110.8 | 106.7 |
| Shrimp, lge. (26-30 count), 5-lb. pkg. | Chicago | lb. | .69 | .64 | 105.7 | 99.2 | 120.4 | 83.3 |
| Canned Fishery Products: | | | | | 99.0 | 98.0 | 97.7 | 103.4 |
| Salmon, pink, No.1 tall (16 oz.), 48 cans/cs. | Seattle | cs. | 22.65 | 22.65 | 122.0 | 120.0 | 120.0 | 114.8 |
| Tuna, lt. meat, chunk, No. 1/2 tuna (6-1/2 oz.), 48 cans/cs. | Los Angeles | cs. | 10.85 | 10.60 | 78.2 | 76.4 | 76.4 | 92.3 |
| Sardines, Calif., tom. pack,No. 1 oval (15 oz.), 48 cans/cs. | Los Angeles | cs. | 7.75 | 7.50 | 90.4 | 87.5 | 87.5 | 88.1 |
| Sardines, Maine, keyless oil, No. 1/4 drawn (3-1/4 oz.), 100 cans/cs. | New York | cs. | 7.70 | 7.70 | 81.9 | 81.9 | 79.8 | 87.3 |

1/Represent average prices for one day (Monday or Tuesday) during the week in which the 15th of the month occurs. These prices are published as indicators of movement and not necessarily absolute level. Daily Market News Service "Fishery Products Reports" should be referred to for actual prices.

The subgroup index in November for frozen processed fish and shellfish reflected the higher frozen shrimp prices at Chicago. Frozen fillet prices were about unchanged from October and the same month a year ago. The November 1956 index for this subgroup increased 11.7 percent as compared with October and was up 8.1

percent over November 1955. Frozen shrimp prices rose 20.4 percent from October to November and were 15.7 percent higher than in November 1955--a reversal of the usual fall trend which is generally downward.

Prices for canned fishery products in general have moved upward steadily for the previous three months due to firm markets for both the California and Maine sardines. The subgroup index for all canned fish rose 1.6 percent when compared with the previous month, but was still about 2 percent below November 1955. The season for packing Maine sardines ended on December 1 and although the pack was fair it was below the average for the last ten years. In November the catch of California sardines was disappointingly low. Although the pack of canned tuna at the end of November was at a record level, sales have been good and shorter packs of competing canned fish have tended to strengthen the canned tuna market.

## OCEAN PERCH CASSEROLE IS POPULAR

Frozen ocean perch fillets--plentiful and moderately-priced--rate very high in popularity. They have the added attraction of offering welcome relief from year's-end food budget problems.

This mild and agreeably-flavored fish is excellent in combination with other foods. A casserole containing fish (which is a high quality protein food), vegetables, and topped with pastry is a well-rounded meal in itself. Baking and serving this casserole in the same dish is an easy way to bring food piping hot to the table.

The home economists of the United States Fish and Wildlife Service recommend "Ocean Perch and Vegetable Pie" as a moderately priced well-rounded casserole dish.

OCEAN PERCH AND VEGETABLE PIE

1 POUND OCEAN PERCH FILLETS, FROZEN
1 QUART WATER
1 TABLESPOON SALT
2 TABLESPOONS BUTTER OR OTHER FAT
2 TABLESPOONS FLOUR
$\frac{1}{4}$ TEASPOON SALT
DASH PEPPER
1 CAN ($10\frac{1}{2}$ OUNCES) CONDENSED
$\frac{1}{2}$ VEGETABLE SOUP
$\frac{1}{2}$ CAN WATER
1 CUP PASTRY MIX

Thaw fillets. Skin fillets and place in boiling salted water. Cover and return to boiling point; simmer 10 minutes or until fish flakes easily when tested with a fork. Drain and flake.

Melt butter; blend in flour and seasonings. Add soup and water; cook until thick, stirring constantly. Add fish. Pour into well-greased casserole. Prepare pastry as directed. Cover casserole with pastry. Bake in a very hot oven, 450° F., for 20 to 25 minutes or until brown. Serves 6.

## International

### GENERAL AGREEMENT ON TARIFFS AND TRADE

ELEVENTH SESSION OF CONTRACTING PARTIES: Several issues of primary importance to the future work of the Contracting Parties to the General Agreement on Tariffs and Trade were considered during the eleventh regular session of the Contracting Parties. The Session began on October 11 and closed on November 17, 1956, in Geneva, Switzerland.

During the Session, arrangements were made for the Contracting Parties to hold comprehensive consultations during 1957 with most of the countries maintaining import quotas for balance-of-payments reasons. This will be the first general examination of such quantitative restrictions since the General Agreement was initiated in 1948.

Preliminary discussion was held with regard to the relationship of the General Agreement to current negotiations in Brussels on a European common market or customs union among Belguim, France, Germany, Italy, Luxembourg, and the Netherlands. A similar discussion took place with regard to studies in Paris which may lead to a free trade area between members of the proposed customs union and various Western European countries, such as the United Kingdom. In view of the preliminary nature of the Brussels and Paris work, it was not possible to discuss the substance to any great extent. It was agreed, however, that if these plans mature, such discussions would take place at a future time, and procedures for the consultation were established.

The way was cleared under which Nicaragua, a contracting party, and four neighboring states which are not contracting parties can form a Central American free trade area.

The session just concluded was a regular annual meeting during which the contracting parties discussed various matters which had come up under the administration of the General Agreement.

Thirty-five countries are presently contracting parties to the General Agreement on Tariffs and Trade.

Other Actions on Import Restrictions: During the session, the Contracting Parties conducted their annual consultations on discriminatory import restrictions with Australia, Ceylon, New Zealand, Rhodesia and Nyasaland, and the United Kingdom.

In each case, some progress was noted in the reduction of discrimination against dollar goods during the past year. Ceylon, in particular, made a major move in September 1956 when it removed its monetary ceilings on the licensing of dollar goods and established a de facto regime of nondiscrimination, which results in the automatic licensing of virtually all imports from the dollar area.

In addition, the United States Delegation held bilateral consultations with the delegations of 13 countries: Australia, Brazil, Ceylon, Denmark, France, Germany,

India, Italy, Japan, The Netherlands, New Zealand, Norway and the United Kingdom. These discussions covered import restrictions maintained by these countries on specific commodities which created a hardship to United States producers or were unduly discriminatory toward United States goods. In each case the United States Delegation suggested that the other country consider whether a relaxation of the restriction could be made without disrupting that country's balance-of-payments position. Fisheries products were discussed with four countries (Denmark, Germany, Norway, and the United Kingdom).

Results of the discussions were generally favorable. Several assurances of immediate favorable action were obtained; in some instances the prospect of fairly early reduction in the level of such restrictions was indicated; while in a few instances the countries indicated a need for the continuance of the restrictions. In each case, however, a full and frank discussion of the restrictions, the reasons for their maintenance, proposals for their elimination, or the need for their continuance served to provide a basis for mutual understanding and for further consultations in the future.

The Contracting Parties issued their Seventh Annual Report on the Discriminatory Application of Import Restrictions.

Note: Also see Commercial Fisheries Review, November 1956, p. 65.

## GREAT LAKES FISHERIES COMMISSION

FIRST ANNUAL MEETING AT ANN ARBOR, MICHIGAN: The Great Lakes Fisheries Commission on November 20, 1956, completed a two-day annual meeting at the University of Michigan in Ann Arbor. The Commission, which was established by treaty between Canada and the United States, consists of three representatives from Canada and three from the United States. The meeting was lead by the Commission Chairman, John L. Farley of the U. S. Fish and Wildlife Service and Vice-Chairman, Dr. A. L. Pritchard, of the Canadian Department of Fisheries.

The Commission's major concerns are control of the parasitic sea lamprey in the Great Lakes, and the planning, promotion, and coordination of fishery research with a view towards maintaining fishery production from the Great Lakes on a sustained yield basis.

The most important task accomplished by the Commission at this meeting was a thorough review of the research and lamprey control operations carried out during the past season. The commission heard reports in detail from scientists from Canada and the United States who are carrying out its programs.

The Fisheries Research Board of Canada and the U. S. Fish and Wildlife Service of the United States, under the direct supervision of the Commission, engaged in a $900,000 lamprey control program during 1956. These two organizations during the past season have installed barriers on all streams tributary to Lake Superior now known to contain lamprey runs--81 barriers are now in operation. The records of rate of increase in the abundance of sea lampreys in Lake Superior emphasizes the urgent need for effective control. The number of spawning-run individuals captured in 30 streams that contained barriers in 1954-1955 were: 1954, 4,922; 1955, 8,823; 1956, 19,009. In 1956 the number of lake trout bearing lamprey scars taken in the fishery approximately doubled over 1955.

In Lake Michigan, 19 barriers were operated that took more than 54,000 lampreys in the Green Bay-northwest Michigan area, and currently barriers are being installed on 55 additional streams and should be ready for operation in 1957. In Lake Michigan the control network will be completed by early 1958.

In Lake Huron during the current season streams were surveyed and sites selected for installation of barriers. Installation is planned for 1958.

Preliminary studies in cooperation with Ohio, Pennsylvania, and New York, and the Province of Ontario have been made on the lamprey situation in Lakes Erie and Ontario.

At the same time the Commission is investigating other methods of control. One of these is the development of a direct current electrical device which will guide the lamprey into a trap where it can be destroyed. Two pilot models of such a direct-current device were tested. The results were especially gratifying. This device, if it proves out, will be more economical to operate than other types of electrical barriers.

A great deal of work has been done on chemicals which will kill lamprey but not affect other fish. The results of laboratory work with these chemicals indicate that they may be successful in the control of the lamprey before it becomes parasitic, but extensive field tests are required and a number of intricate problems will have to be solved before the Commission will know whether or not these chemicals will be useful.

Commission scientists are following up another possible means of control which would involve the use of ultrasonic vibrations. During the course of the ultrasonic experiments it was discovered that lamprey are capable of creating electrical impulses which result in an electrical field around the head region of the lamprey.

In addition to the lamprey control work, research agencies in the United States and Canada have, during the past season, carried out a quarter of a million dollar Commission research program on the fisheries.

A major aspect of these studies has been an inquiry into the direct and indirect consequences of sea lamprey predation on the deep-water populations such as lake trout, whitefish, and chubs. Further research has been carried out on fisheries not affected or little affected by sea lamprey as part of a long-term program to determine the factors that control levels of abundance and production.

These researches are being carried out on all five of the Great Lakes by scientific staffs totaling some 55 persons, operating from 7 research stations with 6 vessels at their disposal.

## INTERNATIONAL PACIFIC SALMON FISHERIES COMMISSION

1956 FRASER RIVER SOCKEYE SALMON RUN BELOW BROOD-YEAR 1952: The 1956 run of Fraser River sockeye, including the commercial and Indian catch as well as the escapement, declined 14 percent relative to the brood-year 1952. In 1955 the run declined 17 percent relative to the brood-year 1951. Survival conditions affecting the 1956 run were slightly better than those affecting last year's run; nevertheless a negative condition existed which is not considered to be representative of normal productivity.

In spite of the decline in the total run, special consideration was given to obtaining adequate escapement with the result that the total escapement actually increased slightly over that recorded in the brood-year. The 1956 escapement of 888,000 sockeye salmon was 32.2 percent of the total run. A year ago overfishing combined with the 17-percent decline in the total run resulted in an escapement of only 14.6 percent of the run. The 1955 escapement was not favorable to maintaining the 1955 cycle on a maximum production basis, hence every effort was made in 1956 to avoid a duplication of the unfavorable 1955 catch-escapement ratio.

The total 1956 escapement was satisfactory and the individual racial escapements are considered favorable to the maintenance of this cycle on a maximum potential level of productivity. The escapement of many races showed substantial

declines in productivity, but in most cases the decline can be attributed to the gradual formation of dominant year-classes on other cycle years. These declines have been predicted for several years in the annual reports of the International Pacific Salmon Fisheries Commission.

The Chilko River, Gates Creek, and Silver Creek runs were the only dominant year-classes expected, and in each case the production and escapement was satisfactory although below the maximum expected. Chilko produced a total catch of 1,120,000 sockeye and an escapement of 647,000 for a total racial run of 1,767,000 fish. The run to Chilko has shown a consistently greater ability to escape the fishing gear than the other races. This year's Chilko escapement was 36.6 percent of the Chilko run while the escapement of all other races was only 24.4 percent. The escapement to Chilko was actually in excess of calculated requirements for maximum production, but was a necessary result of allowing the escapement of other races migrating at the same time to be maintained at a reasonable level.

In the lower river area, the escapement to Cultus Lake appears satisfactory. The run to Weaver Creek had been seriously affected by drought conditions in the brood-year, and a substantial drop in population size was expected on the basis of the fry emergence count in the spring of 1953. For the first time in several years the Birkenhead run held relatively steady with the decrease in the size of escapement due almost entirely to a decline in the number of three-year-old fish, which have no value in reproducing the population. The Pitt River escapement was almost entirely five-year-old fish; the 32,258 fish on the spawning ground compares favorably with the figure of 37,833 recorded in 1951.

If the surplus escapement to Chilko could have been taken in the fishery, the total catch would have approached the 2,000,000 figure anticipated as the minimum catch for 1956. The actual catch was 1,802,000 for both countries, and was divided within 12,000 fish of equal division between the fishermen of Canada and the United States.

In conclusion, it may be said that the 1956 run approached very closely to the minimum expected, but well below the maximum potential. The escapement is considered satisfactory for maintaining the cycle at a potentially high level of productivity.

## NORTHWEST ATLANTIC FISHERIES COMMISSION

Mesh regulations for the trawl fishery for Cod and Haddock in Subareas 3, 4, and 5: Agreed to by the Commission in its 1955 Annual Meeting, mesh regulations for the trawl fishery for cod and haddock in subareas 3, 4, and 5 have been accepted by the Governments concerned and were expected to be put in force by the beginning of 1957 Proposals for some minor changes in these regulations, dealing with saving gear used and with exemptions in order to avoid impairment of fisheries conducted primarily for species other than cod or haddock, were made by the Commission at its 1956 Annual Meeting. These proposals were transmitted by the Depositary Government to the member countries. Acceptance by governments has up to date been received from Norway.

Annual Meeting: The Commission in its 1955 meeting agreed to a change in the 1949 Convention in order to make possible the holding of Annual Meetings not only in North America but in any of the participating member countries. The United States Department

of State has now informed the Secretariat on August 21, 1956, that all ten member governments had approved this amendment to the 1949 Convention, the Commission's December 3, 1956 newsletter points out.

The 1957 annual meeting will be held in Lisbon, Portugal, May 20-25. It will be preceded by meetings of the Standing Committee on Research and Statistics on May 17-18, and followed by a Workshop on Population Dynamics and on the Selectivity of Fishing Units, May 27 to June 3.

The Food and Agriculture Organization of the United Nations and the Conseil Permanent International Pour l'Exploration de la Mer have accepted an invitation by ICNAF to hold their proposed meetings on the same or similar problems in Lisbon at the same time, in order that the three organizations could hold joint meetings, when convenient. To ensure the fullest possible cooperation of the three organizations in the Workshop, a "steering committee" has been set down composed of one member from each of the three sponsoring organizations.

The meeting will take place in the sea coast resort of Estoril some 15 miles from the center of Lisbon.

## TERRITORIAL WATERS

NORWAY AND RUSSIA NEGOTIATE ON TERRITORIAL WATERS: Negotiations began on December 3 between Norway and Soviet Russia to determine the point of demarcation of the fisheries territorial waters boundary between the two countries in the Varangerfjord area. The negotiations now in progress were the result of a request by Norway to the Soviet Union for a meeting to solve the problems arising from the seizure of more than 20 Norwegian vessels by the Soviets during recent months. The Norwegian vessels were allegedly fishing in Soviet territorial waters (Morgenbladet, December 3, a Norwegian daily newspaper).

## UNITED NATIONS

TERRITORIAL WATERS AND FISHERY JURISDICTION CONSIDERED BY COMMITTEE: The sixth committee of the United Nations began consideration on December 3, 1956, of the report of the International Law Commission (ILC) on the "Final Report on the Regime of the High Seas, the Regime of the Territorial Sea, and Related Problems." Included in this report are recommendations regarding international limits to territorial waters and fishery jurisdiction, which are important to the fishery industries.

On November 27 the United States introduced, together with 22 co-sponsoring nations, a resolution calling for endorsement of the recommendation of the ILC that its report on the law of the sea be referred to a special international plenipotentiary conference for study and consideration, which would take account of the legal, technical, biological, economic, and political aspects of the problem.

The United States resolution refers the ILC report to the specialized conference as the basis for its consideration of the various problems involved in the development and codification of the law of the sea. This resolution is entirely procedural and it had been hoped that any substantive discussion on the merits of the various topics covered by the ILC report would be deferred until this contemplated special conference had been convened.

While the United States believes that future consideration of these matters should be concerned also with the technical and biological aspects when appropriate to their context, a considerable number of delegations at this meeting would have the primary if not the total emphasis of future discussions rest on political and economic considerations.

Two proposals were put forward by Canada and Venezuela, that would go far in defining the limits on territorial waters and fisheries jurisdiction.

The Canadian spokesman recalled that his country has historically promoted the three-mile limit to territorial waters. He noted that many countries including his own had already found such a narrow limit to be inadequate or insufficient with regard to customs, fiscal matters, and sanitation control, and that as a consequence many countries had already established a 12-mile contiguous zone to deal with these matters. The Canadian delegate observed that it was the opinion of his government that the narrow three-mile territorial limit was now also insufficient to permit proper control and regulation of fisheries by the coastal state, adding that Canada was submitting an extension of a contiguous zone for the control and regulation of fisheries to 12 miles, for consideration by the proposed world conference. He added that under this compromise plan the breadth of the territorial sea would still remain at three miles, but that fishery regulations and control would be divorced from other considerations in the territorial sea. According to the Canadian spokesman, this separate fisheries treatment would allow each state to control its fisheries without the complication of international law and that this specialized extension would not endanger freedom of the seas nor air navigation.

The Venezuelan delegation presented support for a 12-mile territorial sea with the privilege of extending fisheries zones further if and when they saw fit, and it was particularly noted that his country recognized no historic right of any country in this respect.

General debate on the report of the ILC report was continued the week of December 10 by the sixth committee of the United Nations. Delegates from most of the countries represented at the session were able during the week to state their positions.

The positions voiced generally followed the historic position taken by each country in recent years. Regarding the compromise proposal introduced by Canada a week earlier only one nation--Ireland--took notice of it in public discussion. Also, there was little informal comment on the Canadian proposal among the delegates.

It appeared that the countries favoring a 200-mile jurisdiction, such as Chile, Ecuador, and Peru, receded somewhat from their former extreme positions to the extent of stating that if conservation problems connected with fishing off their coasts are accommodated, their interest in extended sovereignty would diminish.

From comment in debate, most countries seemed to favor adoption of the United States proposal to endorse the recommendation of the ILC that its report on the law of the sea be referred to a special international conference for study.

On December 20 the sixth committee of the United Nations concluded its consideration of the ILC report and adopted a resolution referring the general subject of the Law of the Sea to a plenipotentiary conference to be held in Rome, early in 1958.

This resolution was introduced by 23 nations: Australia, Brazil, Ceylon, Cuba, Denmark, Dominican Republic, France, Greece, Guatamala, Mexico, Netherlands, New Zealand, Norway, Pakistan, Panama, Philippines, Portugal, Spain, Sweden, Thailand, United Kingdom of Great Britain and Northern Ireland, United States, and Uruguay. A total of 65 countries approved the resolution, with one dissenting vote--Iceland.

In view of the numerical support for this resolution, it may be expected to receive approval of the General Assembly. It is not known when the resolution will come before the General Assembly.

The text of the final resolution is as follows:

"The General Assembly,

"Having received the report of the International Law Commission covering the work of its 8th Session which contained draft articles and commentaries on the Law of the Sea,

"Recalling that the General Assembly in Resolution 798(8) of December 7, 1953, 'having regard to the fact that the problems relating to the high seas, territorial waters, contiguous zones, the continental shelf and the superadjacent waters were closely linked together juridically as well as physically,' decided not to deal with any aspect of those matters until all the problems involved had been studied by the International Law Commission and reported upon by it to the General Assembly.

"Considering that its Resolution 899 (9) of December 14, 1954, requested the International Law Commission to submit its final report on those subjects in time for the General Assembly to consider them 'as a whole' at its Eleventh Session,

"Taking into account also Paragraph 29 of the Commission's report wherein, 'the Commission considers--and the comments of governments have confirmed this view--that the various sections of the Law of the Sea hold together, and are so closely interdependent that it would be extremely difficult to deal with only one part and leave the others aside,'

"1. Expresses its appreciation to the Commission for its valuable work on this complex subject;

"2. Decides, in accordance with the recommendation contained in Paragraph 28 of the Commission's report, that an international conference of plenipotentiaries should be convoked to examine the Law of the Sea, taking account not only of the legal, but also of the technical, biological, economic and political aspects of the problem, and to embody the results of this work in one or more international conventions or such other instruments as it may deem appropriate;

"3. Recommends that the conference should study the question of free access to the sea of land-locked countries, as established by international practice or treaties;

"4. Requests the Secretary-General to convoke such a conference in Rome early in March 1958;

"5. Invites all states, members of the United Nations, and states, members of the specialized agencies to participate in the Conference and to include among their representatives experts competent in the fields to be considered;

"6. Invites the interested specialized agencies and inter-governmental bodies to send observers to the conference;

"7. Requests the Secretary-General to invite appropriate experts to advise and assist the Secretariat in preparing the conference, with the following terms of reference:

"a. To obtain in the manner in which they think most appropriate from the invited governments any further provisional comments the governments may wish to make on the Commission's report and related matters, and to present to the conference in systematic form any comments made by the governments and the relevant statements made in the Sixth Committee in the Eleventh and previous sessions of the General Assembly;

"b. To present to the conference recommendations concerning its method of work and procedure, and other questions of an administrative nature;

"c. To prepare or arrange for the preparation of working documents of a legal, technical, scientific or economic nature in order to facilitate the work of the conference;

"8. Requests the Secretary-General to arrange also for the necessary staff and facilities which would be required for the conference, it being understood that the technical services of such experts as are needed will be utilized;

"9. Refers to the conference the Commission's report as a basis for its considerations of the various problems involved in the development and codification of the Law of the Sea; and also the verbatim records of the relevant debates in the General Assembly, for consideration by the conference in conjunction with the Commission's report;

"10. Requests the Secretary-General to transmit to the conference all such records of world-wide or regional international meetings as may serve as official background material for its work;

"11. Calls upon governments invited to the conference and the groups thereof to utilize the time remaining before the opening of the conference for exchanges of views of the controversial questions relative to the Law of the Sea;

"12. Expressed the hope that the conference will be fully attended."

Note: Also see Commercial Fisheries Review, October 1956 p. 41 and September 1956 p. 49.

## UNITED STATES AND CANADA SIGN PINK SALMON CONSERVATION AGREEMENT

The United States and Canada on December 28, 1956, signed in Ottawa a Protocol to the Sockeye Salmon Convention of 1930 placing the pink salmon of the Fraser River System under the terms of the Convention. Signing on behalf of the United States were Ambassador Livingston T. Merchant and William C. Herrington, Special Assistant for Fisheries and Wildlife to the Under Secretary of State. Minister of Fisheries James Sinclair signed for Canada, a December 28, 1956, news release from the State Department announced.

Pink Salmon (Oncorhynchus gorbuscha)

The Protocol amends the 1930 Convention in a number of ways. Its most important change is to place the pink salmon of the Fraser River System under the jurisdiction of the International Pacific Salmon Fisheries Commission. The Commission which was established in 1937 consists of three representatives each from the United States and Canada. It has had since 1937 the responsibility for the investigation and management of the Fraser River sockeye salmon. Its success in the sockeye fisheries has been outstanding.

The Commission will now have the same powers of research and regulation over pink salmon as it has over sockeye salmon. It is charged with so regulating the pink salmon fisheries as to achieve maximum sustainable productivity of the pink salmon stocks. At the same time it must, so far as is possible, divide the catch equally between United States and Canadian fishermen. The Convention area remains unchanged. It covers Juan de Fuca Strait, part of Georgia Strait, the Fraser River System, and an area of the high seas of the Pacific Ocean. The Fraser River pink salmon, which make their spawning runs every two years through the Straits, account for much of the $10,000,000 pink salmon catch made every other year by the fishermen of Washington and British Columbia.

Other modifications made by the Protocol in the Convention include an increase in the size of the Commission's Advisory Committee and a greater flexibility in the Commission's power to issue regulations in certain areas. The Protocol also provides for intensive investigation by the Commission and by research agencies on both sides of the border of all pink salmon stocks which enter Convention waters. The Protocol calls for a United States-Canadian Government meeting in its seventh year of operation for a review of research findings and a consideration of further arrangements for pink salmon conservation.

The Protocol is subject to the advice and consent to ratification of the United States Senate. It will enter into effect upon the exchange of ratifications by the two Governments.

The Protocol is as follows:

PROTOCOL

Between the United States of America and Canada to the Convention for the Protection, Preservation and Extension of the Sockeye Salmon Fisheries in the Fraser River System, signed at Washington on the 26th day of May 1930.

The Government of the United States of America and the Government of Canada, desiring to coordinate the programs for the conservation of the sockeye and pink salmon stocks of common concern by amendment of the Convention between the United States of America and Canada for the Protection, Preservation and Extension of the Sockeye Salmon Fisheries in the Fraser River System, signed at Washington on the 26th day of May, 1930, hereinafter referred to as the Convention,

Have agreed as follows:

Article I

The Convention as amended by the present Protocol shall apply to pink salmon with the following exception:

The understanding stipulated in the Protocol of Exchange of Ratifications signed at Washington on the 28th day of July, 1937, which provides that "the Commission shall not promulgate or enforce regulations until the scientific investigations provided for in the Convention have been made, covering two cycles of sockeye salmon runs, or eight years;" shall not apply to pink salmon.

Article II

The following words shall be deleted from the first sentence of Article IV of the Convention:

". . . that when any order is adopted by the Commission limiting or prohibiting taking sockeye salmon in any of the territorial waters or on the High Seas described in paragraph numbered 1 of Article I, such order shall extend to all such territorial waters and High Seas, and, similarly, when in any of the waters of the United States of America embraced in paragraph numbered 2 of Article I, such order shall extend to all such waters of the United States of America, and when in any of the Canadian waters embraced in paragraphs numbered 2 and 3 of Article I, such order shall extend to all such Canadian waters, and provided further . . . ."

Article III

The following paragraph shall be added to Article VI of the Convention:

"All regulations made by the Commission shall be subject to approval of the two Governments with the exception of orders for the adjustment of closing or opening of fishing periods and areas in any fishing season and of emergency orders required to carry out the provisions of the Convention."

Article IV

Article VII of the Convention shall be replaced by the following Article:

"The Commission shall regulate the fisheries for sockeye and for pink salmon with a view to allowing, as nearly as practicable, an equal portion of such sockeye salmon as may be caught each year and an equal portion of such pink salmon as may be caught each year to be taken by the fishermen of each Party."

Article V

Paragraph (3) of the understandings stipulated in the Protocol of Exchange of Ratifications signed at Washington on the 28th day of July, 1937, shall be amended to read as follows:

"That the Commission shall set up an Advisory Committee composed of six persons from each country who shall be representatives of the various branches of the industry including but not limited to, purse seine, gill net, troll, sport fishing and processing, which Advisory Committee shall be invited to all non-executive meetings of the Commission and shall be given full opportunity to examine and to be heard on all proposed orders, regulations or recommendations."

Article VI

1. The Parties shall conduct a coordinated investigation of pink salmon stocks which enter the waters described in Article I of the Convention for the purpose of determining the migratory movements of such stocks. That part of the investigation to be carried out in the waters described in Article I of the Convention shall be carried out by the Commission.

2. Except with regard to that part of the investigation to be carried out by the Commission, the provisions of Article III of the Convention with respect to the sharing of cost shall not apply to the investigation referred to in this Article.

3. The Parties shall meet in the seventh year after the entry into force of this Protocol to examine the results of the investigation referred to in this Article and to determine what further arrangements for the conservation of pink salmon stocks of common concern may be desirable.

Article VII

Nothing in the Convention or this Protocol shall preclude the Commission from recording such information on stocks of salmon other than sockeye or pink salmon as it may acquire incidental to its activities with respect to sockeye and pink salmon.

Article VIII

The present Protocol shall be ratified and the exchange of the instruments of ratification shall take place in Ottawa as soon as possible. It shall come into force on the day of the exchange of the instruments of ratification.

In witness whereof the undersigned, duly authorized by their respective Governments, have signed this Protocol and have affixed thereto their seals.

Done in duplicate at Ottawa this 28th day of December 1956.

The conference between United States and Canadian delegates also took note of the serious threat which offshore net fishing poses to the conservation of both pink and sockeye salmon stocks and adopted a resolution calling this matter to the attention of the governments and recommending immediate action on their parts to solve the problem.

## Algeria

SHRIMP FISHERY: The Algerian catch of shrimp for 1953-55 averaged 1,559 metric tons a year and was made up predominantly of small gray shrimp, about 40-45 count to the pound heads on. About 80 percent of the catch is taken from off the coasts of the Departments of Algeria and Oran.

The export market is almost exclusively confined to shipments to France, according to an October 31, 1956 dispatch from the United States Consul in Algiers. Exports of shrimp to France are combined with those of spiny lobster and other crustaceans, and it is therefore impossible to estimate the quantity and the value.

There are no shrimp canneries in the country and equipment employed by the fishermen is reported to be old and outmoded. The catch is all made by vessels of Algerian registry, and it is believed that no foreign capital is invested in the fishery.

There is no government program, at present, devoted to the development of the shrimp fishery. The market is limited somewhat by the high cost of transport from Algerian ports to the French market. As far as it can be determined at this time, France has no restrictions on the importation of shrimp, but it is possible that such restrictions could be applied to protect the market for Algerian shrimp.

## Australia

HIGH STANDARDS SET FOR FROZEN SPINY LOBSTER TAIL INDUSTRY: The problems encountered in maintaining a high standard of quality for Australian spiny lobsters are discussed in an article by Dr. Keith Sheard, a fisheries research officer of Australia's Division of Fisheries and Oceanography, which appeared in the October 1956 issue of the Australian Commonwealth Director of Fisheries Fisheries Newsletter. According to Dr. Sheard, the Australian frozen spiny lobster tail trade is a luxury industry depending for success on a high standard of quality. Excerpts from the article follow:

Spiny Lobster (Panulirus penicillatus)

Processing and refrigeration of spiny lobster or crayfish in Australia are of a high standard and the inspection system of the Australian Department of Primary Industry is first class, while the exporters show a high degree of responsibility. The packing plants, however, can process the spiny lobster only in the condition they get them. They cannot improve an already damaged product, particularly when the damage is not easily visible. And yet, any bruising of the spiny lobster, anything that leads to a leakage of blood into the tissues, can result in an unappetizing product, when it is marketed months later, and thousands of miles away.

In 1950, when the Australian export industry of frozen spiny lobster tails was still in its early stages a pamphlet, Care in the Handling of Crayfish, was published as Fisheries Bulletin No. 3 of the West Australia Fisheries Department. This work showed that a number of kinds of darkening or discoloration of the meat could occur during freezing, cold storage, or on thawing. In each case the remedies proved to be very simple even though the chemistry of the discoloration process was often most complicated.

If the shell above the blackened areas is examined very carefully it will often show signs of bruising, and further that the underlying tissues have been damaged. This often happens during catching or sorting, or transport to the factory or freezer boat.

When a spiny lobster is caught and hauled to the surface, the change in its living conditions is sudden and very great. The temperature is altered from the coolness of the sea bottom to the warmth or heat of the boat and bags. The spiny lobster is brought very quickly from its usual darkness to bright sunlight and from high to low pressures. Its oxygen supply becomes limited to the small quantities contained in the film of water around the gills; this oxygen supply, which is renewed very slowly from the air, decreases as the temperature rises. Since there is no current of water to carry them away, the waste products spread over and poison the gills. Changes then occur in the spiny lobster meat and the animal weakens and at length dies. During these changes the meat becomes less and less fit for processing and poor quality frozen tails result.

If, in addition to this, the spiny lobster is crushed or bruised, or otherwise badly handled, each damaged spot leaks its small amount of blood and fluid. Sooner or later darkening appears and the tail loses in value.

Even very simple care on catcher and transport boats, and while the spiny lobster are stored for processing, can make considerable difference to the quality of the pack.

For example, a major cause of bruising and injury is the practice of packing large spiny lobster with small ones. To offset this many fishermen use bag holders, and have two bags open, one for large and one for small spiny lobster. Where wells are used, one side is kept for the larger spiny lobster and the other for the smaller. The large are very powerful and the smaller can be badly damaged as the big ones struggle, particularly in the bags.

Every fisherman, in order to safeguard his income is urged to take precautions along the following lines to insure that every care is taken to see that the spiny lobsters are not injured or damaged at any time.

(a) The spiny lobster should be kept in the light for as short a time as possible, and should always be kept out of direct sunlight.

(b) Temperatures should be kept low.

(c) Overcrowding in wells or crates should be avoided.

(d) Storage in crates or wells should always be in strong currents or tides.

(e) Spiny lobster should not be stored in boat wells or in crates at the sea surface during periods of calm, hot weather.

(f) No spiny lobster, whether loose or in bags, should be exposed to the wind, as this rapidly dries the film of water on the gills.

(g) Bags should never be stored in layers such that there is any crushing or bruising affect on the spiny lobster either during storage and transport or on the weighing scales.

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TASMANIA SCALLOP CATCH SETS NEW RECORD: During the 1956 scallop season the production of scallop meats in the Australian State of Tasmania reached

a record total of 525 tons. This total compares with 511 tons of scallop meats in 1955. The new beds located in Norfolk Bay produced 363 tons of scallop meats, according to the Australia Commonwealth Director of Fisheries Fisheries Newsletter of November 1956.

A large proportion of the Norfolk Bay scallops were mature and towards the end of July showed signs of spawning. However, additional beds of smaller scallops were located and most boats operated on them until the end of the season. Many fishermen reported having located other beds where young scallops were plentiful, so prospects for future years appeared to be sound.

* * * * *

WHALE MEAT EXPORTED TO THE UNITED STATES: In addition to pearl shell, spiny lobster, whale oil, tuna, and shrimp. Australian fisheries have now added a new export--whale meat for use as animal food.

The whale meat is being exported by the whaling station at Byron Bay, northern New South Wales. The company had a contract to supply a minimum of 150 tons of the meat in 1956 to a firm in California.

The contract is the result of two visits to Australia by the Vice-President for the United States company.

The meat is chilled and minced through 1-inch plate at the whaling station, frozen at Byron Bay and Coolangatta, and held at Brisbane in cold storage pending shipment.

The Perth newspaper West Australian says another whaling company has received an offer from the California firm for 2,000-3,000 tons of whale meat. "A spokesman" for the company said no decision would be made until after the 1956 whaling season, states the Fisheries Newsletter for September 1956.

* * * * *

SHRIMP FISHERY CONTINUES TO SHOW PROMISE: Modern packing and processing methods, plus the assurance of regular refrigerated cargo space to both the east and west coasts of the United States, has added shrimp to the list of profitable fishery products exported by Australia. It was predicted in the November 2, 1956 issue of The Fishing News, a British fishery trade publication, that exports to the United States market will reach 1 million pounds by the middle of 1957 and be close to 5 million pounds (valued at US$2.8 million) by 1961.

The center of the shrimp fishery for the export trade is located in Evans Head, a small town about 510 miles north of Sydney on the east coast of Australia. The Evans Head Fishermen's Cooperative, which was formed eight years ago, has a fleet of 41 vessels equipped for offshore fishing. These vessels will concentrate on the shrimp fishery. The Cooperative will sell their shrimp catches to an Australian export firm which acts as agents for a United States marketing firm.

The shrimp cooperative located at Evans Head has purchased machinery from the United States for washing, grading, deheading, and peeling the shrimp. The shrimp will be layer-packed by hand in 2-, 5-, and 7-pound packages for quick freezing. A new building and a quick-freezing plant valued at US$90,000 are now under construction at that port.

Australia does not produce the jumbo size shrimp (about 10-15 count), but has one variety known as the tiger shrimp, which will average 2-3 a pound. This species

varies in color from olive green to light brown and sometimes weighs as much as one pound each. There are three other distinct varieties, the small green school shrimp, the green or brown king shrimp, and the cream-colored banana shrimp, which is a tropical variety found in quantity only in Queensland waters. The Australians prefer the small green school shrimp, but the banana variety is the type that will be exported to the United States. This type, headless and peeled, will range from 25-35 a pound. The small green school shrimp and the tiger shrimp are found on muddy bottom, the king shrimp on sandy bottom, and the banana shrimp have been caught at varying depths and times--during the daytime in 15 fathoms, at night between 25-30 fathoms.

Some of the Evans Head trawlers are fitted with echo-sounders which enable them to fish in deep water where the larger varieties are found. Most of the vessels have ship-to-shore radios for contact with the base plant, for obtaining the latest information on weather conditions and on areas of good production.

The fisherman are now beginning to reap the benefit of intensive research on the part of the New South Wales Department of Fisheries over the past few years.

The new shrimp fishery is reported to be no gold mine for the shrimp trawlers and fishermen. The price paid to the boats for heads-on shrimp is about 25 U. S. cents a pound. A weight loss of almost 40 percent in the heading and peeling process, plus other coasts such as packaging, freezing, transport, etc., add considerably to the export value and the ex-vessel price cannot be higher than 25 cents a pound.

Note: Also see Commercial Fisheries Review, November 1956, p. 71-73; October 1956, p. 52; April 1956, p. 30; and February 1956, p. 44.

## Canada

BRITISH COLUMBIA SALMON PACK, 1956: The British Columbia pack of canned salmon for the 1956 season ending in November totaled 1.1 million standard cases (48 1-lb cans), the Canadian Department of Fisheries reported on December 5, 1956.

The pack of canned salmon during 1956 was 20.9 percent below the previous year's pack and was down about 28.5 percent from the average for the six-year period 1951-56. The pack of pink salmon was lower (56.3 percent below 1955), but this was not unexpected as 1956 is not a cycle year for this species. The sockeye or red salmon pack was up 30.8 percent from 1955, but was disappointing as a better catch was anticipated from the relatively good year-classes between 1951 and 1953.

Table 1 - British Columbia Canned Salmon Pack, 1951-56

| Species | 1956 | 1955 | 1954 | 1953 | 1952 | 1951 |
|---|---|---|---|---|---|---|
| | (Standard Cases--48 1-lb. Cans to Case) | | | | | |
| Sockeye (red) | 320,124 | 244,821 | 680,718 | 510,147 | 449,494 | 428,299 |
| Spring (king) | 11,639 | 17,853 | 14,080 | 13,049 | 9,279 | 13,698 |
| Steelhead | 1,248 | 1,590 | 3,733 | 3,030 | 3,763 | 3,656 |
| Blueback | 10,549 | 10,544 | 4,302 | 2,055 | 5,583 | 13,237 |
| Coho (silver) | 202,456 | 175,179 | 123,778 | 108,109 | 59,370 | 291,303 |
| Pink | 363,181 | 831,253 | 335,550 | 794,764 | 679,182 | 735,468 |
| Chum (keta) | 203,633 | 124,860 | 580,575 | 394,113 | 91,886 | 460,421 |
| Totals | 1,112,830 | 1,406,100 | 1,742,736 | 1,825,267 | 1,298,557 | 1,946,082 |

Note: Also see Commercial Fisheries Review, December 1955, p. 51.

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NEW FISHING VESSEL "SLEEP ROBBER" IS A VERSATILE TYPE: Canada's newest and most modern fishing vessel, the Sleep Robber, sailed from Vancouver on her maiden trip at the end of September 1956 and began fishing for halibut in the Pacific ocean.

The Sleep Robber, built to special design for its owner, has just about everything that is known to make a fishing vessel efficient and comfortable for its crew.

Built in New Westminster, British Columbia, the vessel is an entirely new type which can be used for seining, both for salmon and herring, halibut long-lining, and otter trawling.

The new fishing vessel is 72 feet in length, with a beam of 20 feet. She is powered by a Diesel engine with actuated reverse and reduction gear, which develops 360 Bhp. continuously and is naturally aspirated. It turns a 68 x 43 four-blade propeller at 340 r.p.m. The vessel cruises at 10 knots and is capable of a 12-knot speed when necessary.

The builders of the vessel point with special pride to the main winch, which, they say, is the most advanced feature in the design. This is combination equipment, partly hydraulic and partly mechanical, which operates seines, long lines, and dragger gear.

A striking feature in the appearance of the ship is the absence of the seine table, now becoming a thing of the past, supplanted by a power block suspended from the boom, which takes over the work of hauling in the seine net.

The mast and boom of the Sleep Robber are of steel, and stainless steel is much in evidence in interior fittings. However, the hull of the vessel is mostly timber. Oak frames and fir went into the hull, with plywood for the housing. Decks are of fibre glass, as also are the two lifeboats. Bulkheads are of steel.

In the galley are an oil stove and a gas range, with a deep freezer and a refrigerator for the crew's food supplies. The men's berths are equipped with wash basins of stainless steel and there is a shower for general use.

Navigation equipment includes two radiophones, a radar, a direction finder, and a combination echo-sounder. The latter gives readings for 530 fathoms on slow scale and 65 fathoms on fast scale for herring, and a recording sounder for night running.

An intercom system will reach members of the crew in any part of the vessel. In time-off periods the men will be able to see what is going on in the world by means of two television receivers, one in the captain's room and one in the crew's quarters.

The fish hold is provided with special hold-over plates to preserve ice and thus prolong fishing time. A brine-freezing refrigeration system is installed. The maximum carrying capacity is estimated at 150 tons of herring or lesser quantities of salmon, halibut, or trawl fish.

The cost of building and equipping the Sleep Robber is estimated at approximately C$150,000, according to the September 1956 Trade News of Canada.

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NEWFOUNDLAND SALT FISH INDUSTRY REVIVAL PROPOSED: During an address before, the opening session of the Newfoundland Fishermen's Federation Convention, the Prime Minister of Newfoundland states his government will support actively a revitalization of the salt fish industry in that Province.

The Prime Minister indicated that the policy of the provincial government would be to encourage the improvement of the salt cod fishery, rather than the frozen fish industry. This would reverse recent trends towards expansion of the frozen fish industry.

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TWELVE-MILE LIMIT FOR FISHERIES TERRITORIAL WATERS PROPOSED: At a meeting of the United Nations' Committee Six in New York on December 7, 1956, the Canadian delegate stated Canada would oppose extension of territorial waters beyond 3 miles for various reasons, including security. He stated further, however, that 3 miles was not adequate for jurisdiction over fisheries and, in view of the fact that nations recognize special jurisdiction for customs, sanitation, etc., over a contiguous zone of 12 miles, he stated it was reasonable to include fisheries in this contiguous zone. He emphasized that the jurisdiction of the coastal state over fisheries within this zone must be complete.

Committee Six has been considering the report of the International Law Commission pertaining to all aspects of the law of the sea, including the Continental Shelf, breadth of the territorial sea, innocent passage, etc.

When Committee Six resumes its work, it is expected that many nations will have comments on Canada's proposal.

Debate on the recommendation of the International Law Commission that another world conference be held on fisheries has indicated that most nations will favor such a conference early in 1958.

## Denmark

SECOND INTERNATIONAL FISHERIES TRADE FAIR: The Second International Fisheries Trade Fair will be held at the Exhibition Hall Forum in Copenhagen from from September 27 until October 6, 1957. It was decided to hold the second fair after many exhibitors, who exhibited at the first fair, requested the sponsors to hold another fair in the near future. Preparations are already under way for the next meeting between people in the fishing industry from all over the world. This is due to the fact that the First Fisheries Trade Fair was a much greater success than anticipated, large sales were made, exhibitors made many useful contacts, and the interest shown in the entire fishing industry was much greater than anticipated.

The May 1956 Fair was the first fair of its kind on an international basis. Nearly 50,000 people visited the Forum, and half of them were buyers or prospective buyers, who during the 10 days of the exhibition ordered goods amounting to about US$14.5 million.

A fair of even larger scope and greater variety is now being prepared in Copenhagen for the autumn of 1957. It has already been proved that the geographical position of Copenhagen makes it ideal for international fairs. It is a city which has an airport and a harbor with frequent connections with the rest of the world. It possesses good hotels and ideal exhibition areas at Forum and at the harbor.

The sponsors state that everybody interested in the fishing industry is welcome to participate in the fair, but exhibitors are advised to forward their applications at an early date. The address is: The International Fisheries Trade Fair, Forum, Copenhagen, Denmark.

Note: See Commercial Fisheries Review, January 1956, p. 47.

## German Federal Republic

PNEUMATIC FISH DISCHARGER DEVELOPED: A machine for unloading fish from the holds of fishing vessels that utilizes the same suction principle as the vacuum cleaner has been developed by a West German machine company. The company, which is reported to be one of the leading West German producers of pneumatic

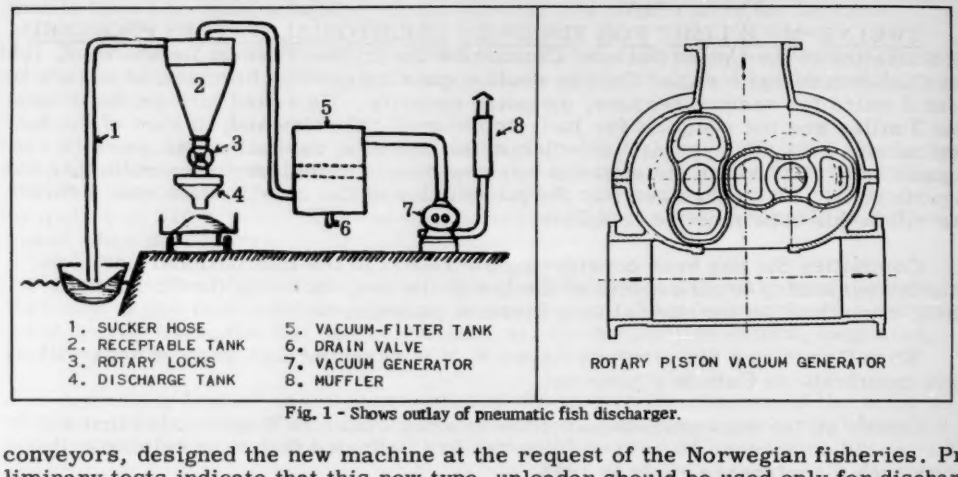


Fig. 1 - Shows outlay of pneumatic fish discharger.

conveyors, designed the new machine at the request of the Norwegian fisheries. Preliminary tests indicate that this new type unloader should be used only for discharging fish destined for reduction plants or other industrial use. Experts who have studied the pneumatic fish discharge agree that it will be extremely difficult to elim-

Fig. 2 - Shows pneumatic fish discharger set-up to unload fish directly from a vessel.

Fig. 3 - Discharge end of pneumatic fish unloader.

inate the chafing of the skin and the rupturing of the stomach walls to such a degree that the machine could be used to unload fish to be used for human consumption.

Preliminary tests of the new machine were made in the fishery port of Bremerhaven. It was found that with a crew of 3-4 operators the machine was capable of discharging about 100,000 pounds of fish an hour. This is about twice as much as is now handled by existing equipment at Bremerhaven, states a November 19, 1956, dispatch from the United States Consulate at Breman.

Tests are still being made to improve the machine, such as giving the suction tubes greater flexibility and operating range, reducing the chafing of the fish by rearranging the inlet into the receptacle tank, and in general making the operation of the machine foolproof.

## Greece

FISHING INDUSTRY EXPANDS SINCE END OF WORLD WAR II: The 1954/55 fish catch by Greek fishermen amounted to 60,000 metric tons as compared with a prewar catch of 25,000-35,000 tons. Fishing activity has increased steadily since the end of World War II with the help of a development program, sponsored and financed by the United States Aid Mission.

Before the war about 3,000 small boats engaged in offshore fishing, few of which were motor driven. By 1955, the number of such boats had increased to 10,500, of which 2,500 are motor propelled. The number of motor trawlers and purse seiners increased from about 500 in 1938 to 683 in 1954 and 745 in 1955. Most of these boats are of postwar construction, and all are equipped with imported or locally-made Diesel or semi-Diesel engines. Many have cold storage and radio communication facilities and some even carry modern depth finders. Since 1953 two medium-size open-sea fishing boats have been added to the country's fishing fleet.

Fish processing also has made marked progress. Greece now has some 120 packing plants with an annual output of about 6,000 tons. There are also 2 fish-canning plants with a total annual output of 500 tons. Plans are under way for the construction of modern fish markets in a number of distribution centers, including Piraeus. These will be equipped with modern handling and storage facilities.

Progress is being made in restocking and developing fresh-water fisheries, particularly in Northern Greece.

The sponge-fishing industry also has made considerable headway since the war, mainly because of the annexation of the Dodecanese Islands, where sponge fishing is an age-long tradition. Before the war about 100 vessels engaged in sponge fishing in Greek waters and along the North African coast, bringing in an annual catch of 40 to 60 tons. In 1954, 144 sponge-fishing craft were in operation. In 1955 the number increased to 159. Production was 130 tons in 1954 and 135 tons in 1955. Competition from synthetic sponges has had an adverse effect on the demand for sea sponges and exports are becoming increasingly difficult. However, stocks have not accumulated in recent years.

Despite the very substantial progress made in agricultural and fishery production in the postwar period, Greece still depends on imports for a substantial portion of its food requirements.

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GRANTS MADE FOR FISHING EQUIPMENT: The Greek Government has granted the sum of US$500,000 to be paid through the Bank of Agriculture for the purchase of fishing equipment. An additional sum of US$580,000 was granted for the same purpose to the owners of vessels fishing in the Atlantic Ocean, according to Aleia (September 1956), a monthly review of the Greek fisheries.

## Hong Kong

INCREASED SHRIMP LANDINGS: The large increase in the number of mechanized boats engaged in shrimp trawling in 1956, as compared with 1955, resulted in rather high total landings, but with a much reduced catch per unit of effort. Ex-vessel prices were slightly higher than last year. This was due to the newly-developed export trade in frozen shrimp.

As opposed to the rest of the fishing fleet, which is almost entirely owner-operated, many shrimp trawlers are now owned and financed by persons from outside the industry. Some 30 to 40 of this latter category of vessels were temporarily laid up during the last quarter of 1956 as income did not cover expenses due to poor catches (Current Affairs Bulletin, November 1956, of the Indo-Pacific Fisheries Council).

## Iceland

FISHERIES TRENDS FOR 1956: With all principal fishing seasons approaching completion in Iceland, it is possible to discern the main outline of the industry for 1956. Briefly, the total herring catch was almost double the previous year because of the better north coast season (83,000 metric tons in comparison with 45,000), and catches of all other species were about unchanged at 294,000 tons in comparison with 298,000 tons, points out a United States consular dispatch from Reykjavik (November 9, 1956).

In general Iceland will accordingly end the year with no significant carryover of stockfish, salt fish or salted herring and a smaller than usual carryover of frozen fish.

Frozen Fillets: Production of frozen fillets amounted to 44,000 tons in comparison with 43,000 tons the previous year, with just under half of the total catch of groundfish species utilized for fillets. The Soviet Bloc took 38,000-40,000 tons of fillets in 1956 in comparison with 32,000 in 1955. Of this, the U.S.S.R. took 28,000 tons in 1956 in comparison with 20,000 in 1955. Exports to the United States were about 15,000 tons in comparison with 11,000 tons in 1955. Because of the greatly increased Soviet purchases and the slightly increased purchases from the United States, there was expected to be no significant carryover on January 1, 1957. For the same reasons a larger share of the 1957 catch is expected to be diverted for freezing.

Herring Meal and Oil: Production in 1956 was expected to be about eight times that of 1955 due to the larger catches in the north. The year nevertheless was another "failure" for this industry which is equipped to handle the tremendous catches of the North Coast of the "good old days." Prices were generally unchanged; demand strong.

Other Fish Meal and Oil: Production in 1956 was higher than in 1955, since $2\frac{1}{2}$ times as much white fish was delivered to the processing plants. This resulted primarily from the storage glut in the frozen warehouses during the summer. Prices were strong, but some carryover was expected.

Fresh Fish on Ice Exported Direct: Fresh fish on ice exported direct in 1956 was almost twice that of 1955 (5,000 tons in comparison with 2,700), but it is still a small item. The trade is not generally favored by the Government since frozen fish earns the nation more foreign exchange, but during the fall, with prices in

Western Germany much higher than those in Iceland, it has been attractive to the trawler owners, a majority of whom are currently focusing their efforts in this direction.

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TRAWLERS RESUME ICED-FISH TRADE: In spite of the agreement previously reported that two-thirds of the Icelandic trawler fleet would fish for the Icelandic freezing plants in return for higher guaranteed prices for fish, 27 trawlers are currently delivering their catches to the German market for fresh fish on ice in comparison with 22 when the agreement was negotiated, a November 1, 1956, report indicates.

Icelandic South Coast Herring Catch as of October 20, 1956 With Comparisons

| Utilization | 1956 | 1955 |
|---|---|---|
| | (Metric Tons, Round Weight) | |
| Salting | 7,071 | 10,795 |
| Freezing | 7,199 | 7,983 |
| Reduction | 1,124 | 922 |
| Total | 15,394 | 19,700 |

Prices for iced fish in Germany in October were about three times those paid in Iceland and there seemed to be little possibility that the trawlers would forego this profitable trade until the differential in prices diminished.

HERRING CATCH: The Icelandic south coast 1956 herring catch was running 25 percent under that of the previous year as of October 20.

## India

ALL-INDIA FISHERIES CONFERENCE HELD IN MADRAS: The first All-India Fisheries Conference was held in Madras city on September 19 and 20, 1956. The Madras Governor inaugurated the conference and the Government of India Minister for Agriculture presided. About 100 delegates representing the various states in India, the Food and Agricultural Organization and the Technical Cooperation Mission, as well as the Norwegian fisheries experts in India participated in the conference.

Among the various developments that have taken place in the fishing industry of Madras State during this period, the Madras Minister for Agriculture enumerated these: (1) opening of new fishing grounds of different fishes; (2) establishment of a shark-liver oil industry; (3) establishment of fish farms and fish-cultural centers; (4) conservation and exploitation of tank and reservoir fisheries, pearl fisheries, and chank fisheries; (5) development of edible oyster industry; (6) utilization of sea weeds; (7) utilization of fish wastes; (8) manufacture of byproducts; and (9) dissemination of statistical and biological information to those engaged in the fishing industry. Probably to stress the importance of the fishing industry, he concluded his address stating: "It has to be noted that the agricultural food resources of the land have almost been exploited to the maximum and we have now to turn to the sea for more food."

The India Minister of Agriculture brought out the big gulf that existed between production and consumption of fish in India and pointed out that for nutrition standards the Indian population needed the minimum of 4.0 million metric tons of fish whereas production was only about 1.1 million tons. He too enumerated the various steps taken by the Indian Government and state governments to develop the fishing industry and sounded a note of satisfaction that a considerable measure of success had been achieved "in spite of the various administrative and technical difficulties." As regards development of inland fisheries, he was optimistic of the good scope offered by the construction of large reservoirs now being undertaken in connection with river valley projects and spoke of the increased fish production from the sea,

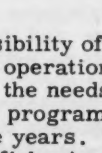
both coastal and offshore deep waters, as a result of fishing from trawlers and powered boats. He acknowledged the "fairly generous assistance" received from foreign assistance programs and made a particular mention of the technical assistance provided by the Food and Agricultural Organization, of the equipment and technical personnel provided by the United States under the Technical Cooperation Program, and of the fishing community development project under the Indo-Norwegian Project. But with all this combined effort of the Federal and state governments and the foreign experts, the Minister said, only a good beginning had been made and a great deal remained to be done to place the Indian fishing industry on its feet.

The conference reportedly discussed several phases of the fishing industry and recommended that: (1) a Central Board of Fisheries should be established to increase and coordinate fisheries research and developmental action; (2) adequate facilities should be provided for augmenting the supply of fish seed for culture purposes by increasing the number of centers and transporting such seeds in larger quantities; (3) river valley fishery boards should be set up for undertaking fishery development programs; (4) no duty should be levied on fuel and lubricating oil used by small power fishing vessels; (5) boat building yards should be established in fishing centers; (6) special facilities should be provided for the fishing industry in minor ports; (7) fish curing should be permitted in centers approved by government; (8) cooperative societies for undertaking fishing boat construction and fish marketing should be organized to raise the socio-economic status of fishermen.

The conference is reported to have examined the particular needs of the shrimp trade and made certain recommendations for consideration by the Government Railway Ministry, a September 25 dispatch from the United States Consul in Madras points out.

The delegates of the conference also visited the Madras harbor to see new power fishing boats designed by the FAO naval architect for fishing operations off the Madras coast and the Corporation Cold Storage where fish, meat, fruits, and vegetables are stored.

The Minister visualized the possibility of setting up a Fishing Corporation to deal with matters relating to fishery operations more promptly and on a scale commensurate with India's coastline and the needs of the people. He made a strong plea for the drawing up of a realistic program for putting to sea as many fishing boats as possible during the next five years. He emphasized the necessity of state governments organizing independent fisheries departments instead of subordinate or attached units if fishery development schemes are to be implemented effectively.



## Indonesia

CANNED SARDINE MARKET: At the present there is practically no sardine canning industry in Indonesia, although the catch of sardines is not inconsiderable, states a November 8 dispatch from the United States Embassy at Djakarta. The domestic sardine catch in 1955 amounted to 1,891 metric tons, valued at US$748,609 (Rp. 8,478,000).

A very small amount of sardinelike fish is canned on the island of Bali (the main Indonesian sardine fisheries are in or near the Straits between Bali and Java) and supplied to the Indonesian armed forces. There are no figures available concerning the volume or value of this production. The canning factory specializes in the canning of beef, fruits, and vegetables, and only handles sardinelike fish during the November-February season.

Current consumption is increasing and the Indonesian Government is conducting an educational program to encourage the eating of more fish, including sardines. Imports have dropped off considerably from the 1951-1952 period and will probably remain at the new lower level in view of Indonesia's foreign exchange troubles, but the domestic catch of sardines is reportedly increasing gradually, with the assistance of the United States ICA teams in Indonesia.

According to the Department of Sea Fisheries, the only size of can used to pack sardinelike fish for the Army is the tall, one-pound can, or a can of approximately that size. The most popular imported sizes are the $3\frac{1}{2}$- to 5-ounce flat cans and the 8-ounce ovals, although 15-ounce ovals and one-pound tall cans are also imported.

Imported sardines packed in tomato sauce and olive oil are the most popular, representing about 40 percent of total imports of each. Sardines in brine account for the remainder of total imports. As far as can be determined, a very small amount of sardines in mustard is imported, but none in vegetable oil or in natural preparation. The low income group consumes the domestic catch and the higher income groups the imported canned sardines.

In the latter part of 1956 the retail market price of the $3\frac{1}{2}$-5 oz. can of Japanese and North African sardines packed in olive oil ranged from 10-11 cents (Rp. 11-12.5); 1-lb. tall in brine, 20-23 cents (Rp. 23-26); Portuguese 8-oz. ovals in olive oil, 15-17 cents (Rp. 17-19); and Japanese and Dutch 15-oz. ovals in tomato sauce, 9-19 cents (Rp. 10-22).

Table 1 - Indonesian Imports of Canned Sardines, 1955

| Country of Origin | Quantity | Value | |
|---|---|---|---|
| | Metric Tons | Rp. 1,000 | US$1,000 |
| Japan | 1,015 | 2,954 | 261 |
| Netherlands | 359 | 1,130 | 100 |
| United States | 108 | 316 | 28 |
| Portugal | 9 | 57 | 5 |
| Norway | 9 | 57 | 5 |
| Denmark | 8 | 46 | 4 |
| South Africa | 13 | 43 | 4 |
| Morocco, Algeria, and Tunisia | 11 | 36 | 4 |
| Total | 1,539 | 4,659 | 411 |

The United States is the third most important supplier of canned sardines to Indonesia and very likely will maintain that position in the near future. Imports of canned sardines will continue to be necessary because of the lack of cannery facilities in Indonesia; however, Indonesia's present foreign exchange position may force the Government to restrict these imports. One effective restriction against imported canned sardines is the Indonesian import surcharge of 300 percent applicable regardless of origin. It is interesting to note that American exports of canned sardines to Indonesia dropped from a postwar high of 9,699 metric tons (valued at US$995,320 or 11,272,000 rupiahs) in 1951 to the 1955 level of 108 metric tons (US$27,903 or 316,000 rupiahs). Imports of United States canned sardines in 1953 and 1954 were even lower than those in 1955. Total imports of canned sardines from all countries dropped from 18,089 metric tons (US$1,865,784 or 21,130,000 rupiahs) in 1951 to 1,539 metric tons (US$411,479 or 4,660,000 rupiahs).

Imported canned sardines are purchased by local import firms for distribution to wholesalers and retailers in the larger cities of Indonesia.

## Italy

CANNED SARDINE MARKET: The Italian canning industry packs a limited quantity of sardines. The industry was more prosperous before the loss of the Istrian peninsula to Yugoslavia after World War II, states a dispatch (October 22) from the United States Embassy at Rome. Several canning plants were located in that area, the best for sardines in the Mediterranean basin. The quality of domestic fish and the high operating cost of the Italian canning industry, as compared to that of other countries, are factors which prevent competitive prices in a liberalized trade. At present two or three large companies and several small firms engage in packing preserved sardines with an estimated annual output of 500-600 metric tons; this is less than 10 percent of national consumption. According to local dealers, Italian sardines are not preferred by consumers because they are very small and have relatively large bones.

National consumption of canned sardines ranges from 6,000 to 7,000 metric tons yearly, judging from import and production figures. The most popular size of can in Italy is flat, about 180 grams (6.3 oz.) gross weight, and the condiment is chiefly olive oil except for a small percentage of Moroccan fish in vegetable oils. Sardines preserved in olive oil with special ingredients and additives such as lemon, tomato, etc., and in some instances boned, are sold only in a very few large and central groceries in main cities but have very little importance in the over-all market.

Table 1 - Representative Italian Retail Prices for Canned Sardines

| Type | Gross Weight | | Net Weight | | Price | |
|---|---|---|---|---|---|---|
| | Grams | Ounces | Grams | Ounces | Lire/Can | U.S. Cents/Can |
| In olive oil: | | | | | | |
| Portuguese ..... | 250 | 8.8 | 180 | 6.3 | 220 | 35 |
| " ..... | 180 | 6.3 | 125 | 4.4 | 130 | 21 |
| Italian ..... | 180 | 6.3 | 100 | 3.5 | 120 | 19 |
| " ..... | 180 | 6.3 | 120 | 4.2 | 110 | 18 |
| Moroccan ..... | 180 | 6.3 | 125 | 4.4 | 90 | 14 |

Note: Values converted at the rate of 625 lire equal US$1.

In 1955, total imports of sardines and anchovies amounted to 10,640 metric tons, of which 5,392 were from Portugal, 3,765 from Spain, 736 from French Morocco, and 581 from Yugoslavia. Efforts to distinguish the quantity of sardines and of anchovies included in this group produced the following estimates: about 5,000 metric tons of sardines were estimated to have been imported from Portugal, and the remaining 300-400 tons were anchovies; from Spain, 3,000 metric tons of anchovies and 600-700 tons of sardines. The 736 metric tons imported from French Morocco were estimated to be all sardines, while the 581 tons imported from Yugoslavia should be considered almost all anchovies. Total imports of sardines in 1955 are thus estimated at about 6,500 metric tons. From the above it appears that Portugal is the leading supplier. This is due to the following reasons: (1) imports of canned fish from Portugal, as well as from all OEEC countries, are not subject to import restrictions; (2) Portuguese sardines have a reasonable wholesale price (about US$11.00 a case of 100 flat cans, approximately 200 grams each, f.o.b. vessel Portuguese port); and (3) the Portuguese product meets the customers' taste. Yugoslav sardines are also easily absorbed by the Italian market because of their low price, but imports from Yugoslavia as well as from Spain are subject to ministerial permits, which are granted by the Italian government in periodical and limited allotments.

Imports of canned fish from the United States are subject to ministerial license. Trade circles consulted are pessimistic about possible commerce with the United States because of the difficulties importers would encounter in obtaining import permits and because American prices are considered noncompetitive.

All cans must clearly indicate the Latin name of the fish to distinguish between true sardines and similar types. The preserving product, such as olive oil, vegetable oil, etc., must also be stated on all containers.

## Japan

CANNED SARDINE EXPORT PACK, DECEMBER 1955-NOVEMBER 1956: The pack of canned sardines for export by the Japanese for the 12 months ending November 30, 1956, amounted to 537,000 cases (48 15-oz. cans to a case) as compared with 420,000 cases for the similar period in 1954/55. Exports of Japanese sardines are made principally to the Philippines, Gold Coast, Belgium, Egypt, and Burma. As of November 30, 1956, 530,000 cases had been sold for export, according to a December 7 dispatch from the United States Embassy in Tokyo.

The figures for the total pack of sardines for 1956 are not available at this time, but indications are that the pack will exceed the 1955 pack of 787,000 standard cases.

* * * * *

FUNDS TO PROMOTE SALES IN U. S. VOTED BY ASSOCIATION: The Japanese International Tuna Association during its first formal meeting voted to spend the equivalent of ¥150 million (about US$417,000) during this Japanese fiscal year to promote the sale of canned tuna in the United States. The funds will be derived 50 percent from Government sources and 50 percent from industry, states a December 6 wire from the United States Embassy in Tokyo.

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FURTHER LOSSES SUFFERED BY CULTURED PEARL INDUSTRY: Following the serious loss of pearl oysters (losses valued at US$1,219,280) suffered by the pearl oyster farms in Mie Prefecture during the month of August, additional losses of US$500,000 were caused by a late summer typhoon.

Japanese oyster experts point out that one of major reasons for these disastrous losses is due to overcrowding of the oyster rafts. The concentration of oyster farms in Mie Prefecture has reached a maximum. As a result of the overcrowded conditions in Mie Prefecture authorities have decided to move 750,000 pearl oysters out of this year's crop of 30 million pearl oysters to a Hiroshima Prefecture island in the Inland Sea this year. If this experiment proves successful, a much larger number of oysters will be transplanted in 1957, states an October 8, 1956 dispatch from the United States Consulate in Nagoya.

Note: See Commercial Fisheries Review, November 1956, p. 93.

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RATIFICATION OF PEACE AGREEMENT WITH RUSSIA IMPLEMENTS FISHERY TREATY: The Japanese Diet on December 5, 1956, completed ratification of the peace agreement between Japan and the Soviet Union. The agreement ends the technical state of war between the two countries, provides for resumption of diplomatic relations, and covers fishing rights for Japanese in waters of Siberia controlled by the Soviet Union. It also includes a sea rescue pack and a trade and navigation protocol.

* * * * *

EXPLORATION OF WEST AFRICAN WATERS PLANNED: As a result of the fishing restrictions imposed on Japanese fleets by the Russian-Japanese fishing agreement, the Noyama Prefecture Deep-Sea Fisheries Association is contimplating

the partial shifting of its operations to the South Atlantic Ocean off the coasts of Nigeria and the Gold Coast in West Africa. The Association's fleet comprises 11 vessels of 70 to 80 tons each and some smaller craft.

The Association states that this area has never been explored or exploited and it is not, therefore, certain that profitable fishing exists there. Consequently the Association plans to send two 30-ton vessels to explore the area during the next two years. The Noyama Prefectural Government is sympathetic with the plan but has not offered financial support. The Association expects to request financial assistance from the Gold Coast Government and from the Governments of the Eastern and Western Regions of Nigeria. No such request has yet been made, states a November 20, 1956, dispatch from the United States Consul in Nagoya.

## Kenya

NYLON NETS TESTED: Nylon nets may revolutionize the African inshore fishing industry on the coast of Kenya. For the past year the Fisheries Division of the Game Department has been testing and modifying nylon nets and plants to encourage Africans to use them instead of the old cotton type.

Using a powered 20-foot Danish fishing boat, the Fisheries Division operated daily on a commercial basis and kept accurate records and cost data to determine the potential of the nets and also the boat. They found that nylon catches three times more fish than cotton; three of the nets caught 61,000 pounds of fish (including shark) in one year. Moreover, the life of nylon is about six times as great as cotton.

The major handicap for African fishermen is capital outlay, for nylon costs several times as much as cotton although this is completely offset by the extra life and fewer repairs. The Danish boats are also expensive--about £700 (about US$2,000) each--but in Zanzibar the Sultan's Government intends subsidizing Africans.

The second handicap is the almost complete lack of a fish marketing and distribution organization in East Africa. Sea fish rarely arrives at Nairobi, the largest single market. This may be overcome, however, if a group of South African businessmen who recently investigated the fishing potential in Kenya decide to go ahead. They will have to establish a cold storage and distribution system.

## Malaya

CANNED SARDINE MARKET: Fish constitutes one of the main staples in the diet of the peoples of Malaya because it is inexpensive and relatively abundant. In some cases, for economic and religious reasons, it is almost the only source of meat protein. Fishing is a major occupation throughout the coastal regions of Malaya. While fresh fish constitutes the main source of supply, the importation of canned and preserved fish of all varieties is very extensive.

There are no sardine-type fish available on a large scale by fishermen supplying the Malayan market. Sardines, brislings, and pilchards therefore have found a fairly sizable market among those who have acquired the taste or in those areas where distribution and seasonal factors allow canned fish to compete in price with fresh fish. Even in the most remote Malay kampongs, it is possible to find a small shop which stocks canned fish of several varieties, including sardines.

A great many more sardines have been exported from Malaya than have been imported (table 1), in spite of the absence of a domestic sardine canning industry,

Table 1 - Malayan Imports and Exports of Canned Sardines Herring and Pilchards, 1953-55

| Year and Type of Product | Imports | | | Exports | | |
|---|---|---|---|---|---|---|
| | Qty. | c.i.f. Value | | Qty. | f.o.b. Value | |
| 1955: | Long Tons | M$1,000 | US$1,000 | Long Tons | M$1,000 | US$1,000 |
| Sardines | 714 | 866 | 286 | 1,170 | 1,316 | 434 |
| Herring | 236 | 312 | 103 | 11 | 18 | 6 |
| Pilchards | 3,229 | 3,559 | 1,174 | 124 | 141 | 46 |
| Total | 4,179 | 4,737 | 1,563 | 1,305 | 1,475 | 486 |
| 1954: | | | | | | |
| Sardines | 1,062 | 1,384 | 456 | 995 | 1,115 | 368 |
| Herring | 211 | 296 | 98 | 30 | 36 | 12 |
| Pilchards | 2,066 | 2,451 | 809 | 135 | 152 | 50 |
| Total | 3,339 | 4,131 | 1,363 | 1,160 | 1,303 | 430 |
| 1953: | | | | | | |
| Sardines | 1,027 | 1,300 | 429 | 1,307 | 1,585 | 523 |
| Herring | 328 | 471 | 156 | 51 | 69 | 23 |
| Pilchards | 2,321 | 2,797 | 923 | 87 | 103 | 34 |
| Total | 3,676 | 4,568 | 1,508 | 1,445 | 1,757 | 580 |

the United States Embassy at Singapore reports (dispatch dated August 17). Trade and government sources explain this by the fact that canned fish has a long "shelf-life: and that many of these exports (actually re-exports) have rested in warehouses for several years. They say, furthermore, that when reoccupying the country in 1945 the British brought in large stocks of canned fish for distribution to the starving populace and that many of these stocks are still in circulation. Singapore's economic prosperity to a considerable extent rests on its position as an entrepot, a position which requires local dealers to keep large inventories of those items in demand from the traditional entrepot outlets in Borneo, Indonesia, Thailand, and Burma. Exports of canned fish are actually re-exports to these surrounding territories.

Table 2 - Malayan Retail Prices and Estimated Percentage of Consumption by Size and Type of Can for Canned Sardines

| Size and Type of Can | Estimated Consumption | Retail Price Per Can | |
|---|---|---|---|
| | Percent | M$ | U.S.¢ |
| 1-lb. tall | 45 | 0.55 | 18 |
| 1-lb. oval | 40 | 0.55-0.75 | 18-25 |
| 8-oz. oval | 7 | 0.35 | 12 |
| 3¼-5 oz. flat | 5 | 0.50-0.75 | 17-25 |
| 8 oz. flat | 2 | 0.95 | 31 |
| 8 oz. tall | 1 | 0.35 | 12 |
| Total ... | 100 | | |

Note: Values converted at the rate of one Malayan Straits dollar equals US$0.33.

It is difficult to estimate consumption trends although local retailers believe the direction is steadily upward. If one judges in terms of similar consumer items, the annual increase should range between 5 and 10 percent, due both to the growing population and rising standard of living. Approximately 45 percent of the consumers prefer the 1-lb. tall and 40 percent the 1-lb. oval can of sardines, and 95 percent prefer sardines packed in tomato sauce. The tomato sauce is much preferred because with it can be mixed herbs and spices of the sort the various races in Malaya most enjoy.

At least 70 percent of sardine consumers belong to the low income group; 25 percent to the middle income group; and 5 percent to the high income group which confines its purchases mostly to brislings and sardines in the smaller size containers. The larger sizes are more popular with the lower income groups. The retail market price of the 1-lb. tall can of sardines is about 18 U. S. cents, and the price for the 1-lb. oval ranges from 18-25 cents (table 2).

Early in 1955 import controls on all types of canned fish of United States origin were lifted and U. S. dollar exchange has since been freely granted. There are no

import duties for canned fish brought into the free ports of Singapore and Penang. However, the Federation of Malaya imposes a 15 percent ad valorem duty on all such items except those from the Empire preference group, specifically South Africa whose level of trade with Malaya in canned fish is consequently very high. The United States, Japan, and Scandinavian countries have good shares, nevertheless, although they vary considerably from year to year.

The most common channel of distribution is from large import houses directly to the retailer, but sometimes through wholesalers. However, there are a great many medium-size food merchants who carry on extensive operations on both the retail side and in the entrepot trade and therefore do their own importing.

One precaution that must be observed closely is in connection with labeling requirements set by government health authorities. In one instance, the Singapore Government objected to labeling as "sardines" certain fish which were larger than normal sardines (young Clupea pilchardus).

The British armed forces in Malaya purchase considerable quantities of sardines for use as field rations. The present monthly requirement is roughly 800 cartons (100 5-oz. cans per carton). While the matter has not been thoroughly investigated, we understand that contracts are bid by local suppliers.

## Mexico

SHRIMP FISHERY TRENDS, NOVEMBER 1956: The November 1956 shrimp catch by Mexican vessels was about normal for the east coast fleet, but the west coast catch was down from October. The strong northerly winds customary at this time of the year limited fishing on the East Coast to periods of good weather.

The West Coast shrimp catch picked up during the last four days of the month with the help of a good run of blue shrimp off the mouth of the Fuerte River in the northern part of Sinaloa. The weir shrimping season in southern Sinaloa and northern Nayarit, which started on September 1, was about over by the end of November. It was estimated that the catch by this type of gear would be only 20-25 percent of the 1955 season. Most of this production was either frozen or canned and practically none dried. As a rule 300-500 metric tons are dried annually for consumption in Mexico.

The shipyards at Mazatlan were busy during the month with 18 vessels under construction and three additional launched and fitting out. Ten of the new vessels on the ways are steel-hulled and are 55-65 feet in length.

## Norway

FISHERIES TRENDS, SEPTEMBER 1956: Norway's 1956 cod fishing season which ended in August brought a catch of nearly 160,000 metric tons, or approximately 36,000 tons more than the previous year. The British market for fresh cod has been good, but stocks of frozen cod are increasing as this market has been less favorable.

Exports of stockfish during the first half of 1956 totaled 11,609 tons as compared with 7,298 tons the previous year, and exports of klipfish rose from 21,178 tons to 23,327 tons.

The tuna fisheries in 1956 were considered a complete failure; the catch by the end of July had only reached 900 tons as compared with 6,000 tons the previous year. By August 1, only 35 carloads of frozen tuna had been exported to Italy, as against 315 carloads in 1955.

The brisling (sprats) fisheries were also reported to have failed, and the brisling canning factories had to switch over to canning mackerel to avoid closing down entirely.

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HERRING FISHERY TRENDS, NOVEMBER 1956: The catch of herring by Norwegian fishermen from off Iceland as of November 15 amounted to 221,640 bbls. (value about US$4.5 million) as compared with 204,000 bbls. as of this date a year ago.

The catch of brisling and small sild herring continues to fall behind that of recent years, states a November 16 dispatch from the United States Embassy in Oslo. The pack of brisling herring totaled only 168,000 cases on October 13 as compared with 243,000 cases during the same period in 1955 and 417,000 cases for the corresponding period of 1954.

The small herring or sild fishery resulted in a pack of 247,000 cases or less than half the 579,000 cases packed by October 13 in 1955. The poor catch is reflected in the exports of brisling which total less than half the number of cases exported in the first ten months of 1955.

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MILD-CURED SALMON IMPORTS DECONTROLLED: The restrictions on the importation of mild-cured or salted salmon into Norway were reported lifted by the Norwegian delegate to the fall 1956 meetings held by member nations to the General Agreement on Tariffs and Trade at Geneva, according to a telegram received by the State Department from Geneva.

## Peru

CANNED SARDINE MARKET: Peruvian production of canned sardines is of commercial importance and does not satisfy the consumer demand either in quantity or in quality, states an August 31 dispatch from the United States Embassy at Lima.

As no true sardines are found in Peruvian waters, the species canned as a substitute are small herring known locally as "Machetes" (Potamalosa notacanthoides) and "anchovetas" (Engraulis ringens). These fish are referred to as sardines. The bulk of the catch of anchovetas and machetes is used either as live bait or for fish meal. The canned pack during the canning season of September-April is estimated at 2,000 cases of 100 4-ounce cans. Peruvian sardines are packed exclusively in cottonseed oil and in 4-ounce flat cans. The number of sardines in each can varies from 4-6 due to the variable sizes of the fish caught.

The entire domestic pack is consumed locally and mainly by the middle and lower income groups. Although the pack is expected to increase gradually on account of the growing population of consuming centers, no special efforts are likely to be made by the industry in accomplishing a significant increase in the immediate future because of the market preference consumers have for the well-known imported brands.

Reliable trade sources estimate the total Peruvian annual consumption of sardines at almost 300 metric tons, of which the domestic production supplies only about 44 tons.

The present consumption trend for sardines is upward. It is believed that consumption of sardines will increase gradually in line with the growth of the population in consuming centers, principally in greater Lima and other important cities in the coastal zone. This growth in population is noticeable in foreign colonies established in Peru (such as the American and European), generally regarded as fish-minded people. This expansion of the foreign colonies is undoubtedly due to present favorable economic conditions in Peru which have attracted a considerable number of businessmen, engineers, and technicians from abroad.

Table 1 - Peru's Imports of Canned Sardines and Sardinelike Fish, 1952-55

| Type of Pack | Quantity | | | | Value | | | | Value | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1955 | 1954 | 1953 | 1952 | 1955 | 1954 | 1953 | 1952 | 1955 | 1954 | 1953 | 1952 |
| | (Metric Tons) | | | | (1,000 Soles) | | | | (US$1,000) | | | |
| Sardines and substitutes packed in oil | 314 | 168 | 216 | 272 | 3,293 | 1,709 | 1,904 | 2,437 | 173 | 90 | 100 | 128 |
| Sardines and substitutes packed in tomato or other sauces | 1 | 2 | 1 | 5 | 19 | 14 | 7 | 41 | 1 | 1 | 1/ | 2 |
| Total | 315 | 170 | 217 | 277 | 3,312 | 1,723 | 1,911 | 1,911 | 174 | 91 | 100 | 130 |

1/ Less than US$1,000.

Almost 99 percent of the sardines consumed in Peru are packed in the $3\frac{1}{4}$-5 oz. flat can. Sardines packed in olive oil account for almost 98 percent of total consumption; packs with cottonseed oil, tomato, and other sauces account for the remaining 2 percent. The percentage of sardines consumed by the high, middle, and low income groups is estimated at 65, 30, and 5 percent, respectively.

Retail market prices for the $3\frac{1}{4}$-5 oz. cans packed in olive oil or tomatoe sauce (imported) range from 3.20-4.50 soles (16-23 U. S. cents) a can, and the 4-oz. cans (domestic) in cottonseed oil from 2.40-2.60 soles (12-13 cents).

Imports (see table) of sardines from the United States are negligible. Importers and consumers regard sardines from Portugal, Morocco, and Spain to be of a superior quality as compared with those of the United States. The lack of aggressive advertising on the part of United States producers and exporters may also be regarded as an unfavorable factor.

Importation and distribution of canned sardines in Peru is done direct by leading foodstuffs importing firms who sell to retail merchants. Grocery stores are practically the only retail outlets for sardines.

Note: Soles converted at rate of 19 equal US$1.

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PERUVIAN-UNITED STATES WHALING COMPANY BUILDS PLANT: A joint Peruvian-United States whaling company is expected to complete the erection of a US$500,000 plant near the northern port of Paita, by January 1957. The capacity of the plant is reported to be about 3,000 tons of sperm oil and 2,000 tons of whale meal a year. Operations are scheduled to start about April 1957. The firm recently purchased three vessels (320 tons, 1,400 hp.) from Norwegians for about US$395,000, according to an October 31, 1956, dispatch from the United States Embassy in Lima.

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FIRST FISH TERMINAL BUILT: A new modern fish terminal for the Lima area was expected to be activated at the end of October 1956. The installations consist of six cold-storage and four freezing chambers plus an ice-making plant. The fish terminal, the first of its type, was built for a total cost of US$210,000, an October 31, 1956 dispatch from the United States Embassy in Lima states.

## Poland

FIVE-YEAR PLAN FOR EXPANSION OF FISHING FLEETS: Poland's fish trawling industry opened the current season with an expanded program of operations. Last year's plan, according to a ministerial statement was completed on November 12, 1956, some 3 weeks ahead of schedule, with an increase of 13 percent over the previous year's catch of about 107,500 metric tons.

This is the first year of a new Five-Year Plan when big sums will be spent on the expansion of shipyards and the trawler industry. Originally the trawler fleet was to have increased by 19 vessels, a new base ship, and a number of cutters for salmon fishing. However, plans are being revised with a view to streamlining production and increasing the fleet.

Modernization of the vessels now in commission is being pushed ahead. The Fayderyk Chopin, the base ship, was overhauled last winter and equipped with a freezing plant. Plans have been prepared by the Fisheries Institute for the transitional period when vessels not always well adapted for distant-water operations will be in use as well as for the later period when the fishing fleet will meet all the requirements of modern fishing techniques, labor conditions, and safety at work. Polish fishing fleets may be seen as far as Greenland and the Newfoundland Banks.

Another series of improved slightly bigger trawlers will be commissioned, and the shipyards will continue deliveries of improved drifters. Base ships will continue to be delivered and by the end of the Five-Year Plan in 1960 Poland will be building trawlers of about 1,000 tons equipped with processing plants. Vessels of 9,600 tons are also to be built, each equipped with a helicopter, to be used in fishing operations. During the next two years Gdansk shipyards, Poland's biggest, will continue to build ships of the present type but will at the same time adapt themselves for the construction of new-type trawlers, several scores of which will be built during the next five years. The trawler B-14 which is now being produced is of 500 tons dead weight and has a range of 7,000 miles; it is equipped with all modern machinery and a fish-meal processing plant. An improved version of the trawler, the B-15, is to go into production in 1958 in the Paris Commune Shipyards in Gdynia. It is a very highly-mechanized vessel equipped with the necessary processing plant. The yards are also to build a number of Diesel and motor trawlers. An alternative plan for the yards submitted to the Ministry of Shipping proposes an additional construction of 850-ton super-motor trawlers of three types; one type of supertrawler with herring-salting installations; a supertrawler equipped with freezing plant; and one type with a white-fish processing plant.

The production of nets is to be increased and 99 percent of the demand will be met from home production. This is due to the opening of a new factory in Swinoujscie and factories in Bydgoszcz and Darlown. Previously most nets were imported.

The catch of sea-caught fish will increase by 50-55 percent during the Five-Year Plan so that by 1960 catches will amount to about 12-13 pounds per capita, the amount of herring being over 5½ pounds. This will mean an increase of more than 3.3 pounds of fish per capita as compared with 1955. Production of canned fish will be nearly doubled. The increase will result primarily from further development of

distant-water fishing which should more than double its catches during the next 5 years. In the first 2 or 3 years there will be further intensive explorations of the North Sea fishing grounds. By 1960, when the fish-processing trawlers have been handed over for use, Polish fishing vessels will go to the fishing grounds in the Barents Sea and the waters off Iceland, Greenland, and Newfoundland. The country will be supplied with large amounts of fish in the form of frozen fillets. Baltic catches will grow by about 20 percent during the next 5 years (World Fishing, October 1956).

## Portugal

Portuguese Canned Fish Pack, January-June 1956

| Product | Net Weight | Canners' Value |
|---|---|---|
| | Metric Tons | US$ 1,000 |
| In Olive Oil: | | |
| Sardines | 1,204 | 731 |
| Sardinelike fish | 1,666 | 1,515 |
| Tuna | 764 | 635 |
| Other species (incl. shellfish) | 165 | 113 |
| In Brine: | | |
| Sardinelike fish | 1,935 | 562 |
| Other species | 75 | 17 |
| Total | 5,809 | 3,573 |

CANNED FISH PACK, JANUARY-JUNE 1956: The Portuguese pack of canned sardines in oil of 539 metric tons during June 1956 failed to improve over the light pack of 625 tons the previous month and was about one-third of the 1,831 cases packed in June 1955. The pack of all canned fish in June 1956 amounted to 2,811 tons, the October 1956 Conservas de Peixe reports.

The total pack of canned fish for January-June 1956 amounted to 5,809 cases as compared with 9,897 cases in the similar period of 1955. Canned sardines in oil (1,204 cases) accounted for 21 percent of the January-June 1956 total pack, much lower than the pack of 5,779 cases for the same period in 1955.

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1956 SALTED-COD LANDINGS FROM GRAND BANKS: The Portuguese fleet of 50 line trawlers (schooners) and 22 otter trawlers was estimated to have landed 72,850 metric tons of wet-salted cod during the 1956/57 season on the Grand Banks. The last of the fleet was scheduled to return to Portugal before Christmas 1956, states a November 29, 1956, dispatch from the United States Embassy in Lisbon.

The 1956/57 salted-cod landings, if borne out by final totals, were expected to exceed those of 1955/56 by 4,313 tons. In terms of dry-salted cod, the 1956/57 landings were expected to yield 51,000 tons (value US$18.3 million) as compared with 48,002 tons in 1955/56 (valued at US$17.3 million). The increased catch in 1956/57 was attributed to a larger fleet and improved techniques.

Note: Values converted at the rate of 28.75 escudos equal US$1.

## Spain

FOUR LARGE TUNA FISHING VESSELS UNDER CONSTRUCTION: The Spaniards are building four large clipper-type tuna-fishing vessels, according to a report in the French periodical Le Marin (November 9, 1956). The vessels were ordered built by an important Spanish ship chandler to be used in the tuna fishery off the Canary and Azores Islands.

It is expected that the tuna caught by these vessels will be frozen and shipped to Italian canneries, according to Italian newspaper reports.

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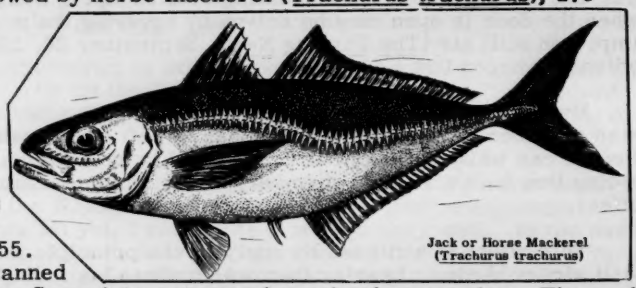
VIGO FISHERIES TRENDS, OCTOBER 1956: Fishing: During the month of October about 15.3 million pounds of fish were landed and sold over the Vigo fish exchange. This was an increase of about one percent over September 1956 landings, but lower by about 10 percent than the same month in 1955. The leading variety sold over the fish exchange in October was the needlefish (Ramphistoma belune) with 3.3 million pounds; followed by horse mackerel (Trachurus trachurus), 2.8 million pounds; and sardine (Sardina pilchardus), 2.4 million pounds. Catches of albacore (Germo alalunga) were close to 330,000 pounds.


Jack or Horse Mackerel (Trachurus trachurus)

Fish Canning: The fish canneries in the Vigo area purchased 4.9 million pounds in September 1956 and 5.9 million pounds in October 1955. The principal fish products canned were needlefish and sardines. Some interest was shown in clam canning. The pack of canned clams is estimated to be about 50 percent above that for recent years. Small sardines were abundant near the river mouths and this was considered to be an encouraging sign for the return of this species in volume to Spanish waters.

The outlook for supplies of tin plate for cans was brighter at the end of the month and the Spanish Government continued to make allotments of olive oil. The price of olive oil in October was about 22-23 U. S. cents a pound, states a November 10 dispatch from the United States Consul in Vigo.

## Sweden

COMMITTEE TO IMPROVE QUALITY OF FISH FORMED: A joint committee, called the Quality Committee and made up of representatives from the fishing industry, the fish processing industry, the association of fish wholesale dealers, the fish dealers' association, and Goteborg fish retailers, has been established on the initiative of the above-named groups and the Swedish governmental agricultural board. The function of the committee is to investigate possibilities of improving the quality of west coast fish and expediting transportation and deliveries of fish to consumers and thereby, it is hoped, increasing the consumption of fish.

At the first meeting of the committee in Goteborg on November 9, 1956, the handling of the catches at sea was discussed, especially with reference to more effective cleaning and sorting. The committee recommended that all big fish should be cut immediately at the throat when brought aboard in order to drain the blood. This practice is said to be followed by Norwegian fishermen and is reported to improve the quality of the fish. It was also found desirable that the fish be sorted on the boats, and that, for instance, there should be three sizes for plaice instead of two as at present.

Fish containers were also discussed and a new type of packing box made of glass fibers and plastic was demonstrated. While much more expensive than the conventional wood box, this new type is said to have the advantage of repeated use with no disagreeable odor.

The fish auctions which are held at the harbor in Goteborg were also discussed, especially with a view to having stricter quality checks, states a November 13 dispatch from the United States Consul at Goteborg.

## United Kingdom

DEVICE TO PREVENT LOSS OF COLD FROM OPEN COLD STORAGE DOORS: The everyday problem of preventing cold escaping from a refrigerated chamber when the door is open may be solved by applying the principal that flowing air will imprison still air (The Fishing News, September 28, 1956, a British fisheries periodical).

By the use of this particular idea, namely the "Miniveil," the door of a refrigerated chamber registering -20° F. can be left open leading into a room at 50° F. People can walk in and out and there will be no material loss of temperature providing that it is a sizable chamber, but even small chambers can use them to great effect.

This effect is achieved by applying the principle that flowing air will imprison still air; cold air is heavier than warm air. Accordingly, when the refrigerator door opens, it naturally "falls out" and frequently can be seen in the form of vapor on the floor as it strikes the warm air of the outside room. As that cold air falls it provides space for warm air to enter at the top of the door and thus leads to an admixture of air and loss of temperature.

The "Miniveil" checks that by simply blowing a fairly strong "veil" of air from the top of the door to the floor. That veil or "waterfall" of moving air is sufficient in practice to keep the cold air from moving out.

As the refrigerated door opens it automatically switiches on a motor in the apparatus overhead. A fan starts up and drives the ordinary air down through the elongated aperture over the door right to the floor.

This apparatus costs about US$560 and solves many problems. It saves the cost of double doors. It saves even rubber doors which are apt to get torn by trucks and trolleys. It gives free passage through the door. It saves time and gives speedy handling. It does away with airlocks. It reduces the risk of accidents. It makes mechanical handling particularly simple and safe.

At one of the big ice cream factories in London where the huge turnover requires incessant transfer of goods from the refrigerated rooms, the doors are left open from early morning to closing time in the evening and there is no measurable rise in temperature.

* * * * *

FACTORYSHIP "FAIRTRY" COMPLETES TENTH TRIP: The British factoryship trawler Fairtry was scheduled to arrive at her home port of Immingham on November 4, 1956, from a three-month trip to the Grand Banks.

This trip was estimated to consist of 400 tons of fillets (mostly cod), 60 tons of whole fish, 150 tons of fish meal, and about 3,000 gallons of fish oil, according to The Fishing News of November 2, 1956.

The Fairtry landed its first trip (also from the Grand Banks) in Immingham on July 28, 1954.

* * * * *

FIRST ICELAND ICED-FISH TRIP SINCE 1952 LANDED AT GRIMSBY: The first Icelandic iced fish to reach the British market via direct landings from fishing vessels through established channels since 1952 was landed at Grimsby by the Icelandic trawler Ingolfur Arnanson on November 27, 1956. The vessel arrived when the market was short of supplies and good prices were obtained, according to a November 29 dispatch from the United States Embassy in London.

*****

FREEZING FISH-AT-SEA EXPERIMENT ENDED: The fishing phase of the British White Fish Authority and British Trawlers' Federation experiment for freezing fish at sea aboard the trawler Northern Wave has ended.

Fish caught during the experiment is still being sold and 4,200 pounds were removed from cold storage for sale on the Grimsby market in mid-October, according to The Fishing News of October 16, 1956. The lot consisted of 3,500 pounds of cod and 700 pounds of haddock.

A representative of the market firm handling the fish said: "We have handled quite a lot of frozen fish for the White Fish Authority before this consignment. Though I have not sold the new lot yet, I anticipate it will go very well. In the past I have had excellent reports back from the retailers who say that the flavor is very good indeed. There has been a slight amount of discoloration, however, but that is all we can say against it. We have sold it through our own shops to canteens and cafes and reports have been uniformly good."

An official of the White Fish Authority states: "We have stocks of the fish frozen at sea still on hand, and we are releasing them gradually on the open market. A full report of the whole experiment will be issued eventually, but at the moment the fishing side has ended."

One of the biggest problems as far as Grimsby is concerned has been the lack of plants where the fish could be thawed out properly. Consequently a proportion of it was placed on the market in its frozen form and buyers had to thaw it themselves.

On the whole inland traders have given very favorable reports of the quality of the fish.

Officials stress that it must be compared with the fish which is caught and iced first on a normal voyage.

It is not intended to compare with prime-quality deep-water fish, and the experiment has been aimed at keeping the first part of the catch in good condition.

Northern Wave cod caught on the Bear Island and Iceland grounds in May and June was also sold in Hull in mid-October and met a ready demand on a day when landings were light. The frozen fish sold at prices ranging from 8.6-9.1 U. S. cents a pound, very near to prices paid for direct landings from trawlers.

# FEDERAL ACTIONS

## Department of the Interior

### U. S. FISH AND WILDLIFE SERVICE

CONSERVATION PROGRAM FOR FISH AND WILDLIFE RESOURCES:

The development of a blueprint by the recently-reorganized United States Fish and Wildlife Service for a broadened conservation program for fish and wildlife resources was requested by the Secretary of the Interior on December 16, 1956.

"The challenge of soundly managing our commercial fishery resources to assure a continued harvest and of meeting the growing demand for opportunities to fish and hunt at a time when those opportunities seem to be diminishing must be met head-on," Secretary Seaton declared. "A special task force will begin work shortly on a plan of action to carry out the long-range effort to meet this challenge."

Secretary Seaton's announcement coincided with a memorandum, which he directed to be distributed to all Fish and Wildlife employees, stating the broad objective of the program and calling upon the employees to contribute suggestions and proposals to further it.

The memorandum calls for a review of policies and projects, and for development of a full effort in the Service's areas of responsibility in the conservation field.

The memorandum declared the Department must "make certain that Federal, State and private conservation activities effectively supplement each other in such a way that greatest progress can be achieved."

As the result of legislation approved by the 84th Congress, the Secretary continued, the Service now has the authority to undertake greatly expanded programs for commercial fisheries. The Service is reviewing every possibility which will benefit the fishing industry. All this material will be used in developing the new program.

Preliminary material in outline form already has been submitted to Secretary Seaton, forming the basis for expanded programs both for sport fisheries and wildlife and for commercial fisheries. This outline envisions a 10-year program. It is proposed that program planning should be accomplished in two segments--immediate, short-range goals which, in turn, will contribute to long-range objectives.

The special "task force" committee is divided into two groups representing the component bureaus of the Service. These task forces will consolidate planning material, establish priorities and spell out research programs.

## Interstate Commerce Commission

FISH AND SHELLFISH EXEMPTION IN REGULATIONS FOR LEASE AND INTERCHANGE OF VEHICLES FOR MOTOR CARRIERS:

New rules and regulations regarding the lease and interchange of vehicles by motor carriers requiring a minimum 30-day lease period, were issued by the Interstate Commerce Commission and became effective February 1, 1957. Among the new rules and regulations published in the December 6, 1956, Federal Register was the following part dealing with equipment used in agricultural or perishable operations which also applies to

vehicles carrying fresh or frozen fish as defined by the Interstate Commerce Commission:

> (i) *Equipment used in agricultural or perishable operations.* That such 30-day minimum period shall not apply to equipment, with driver, of a farmer, agricultural cooperative or private carrier of certain perishable property or which is exempt under section 203 (b) (6) of the act, to the extent that such equipment falls within the terms of the exceptions of section 204 (f) (1) or (2) of the act (49 U. S. C. 304 (f)), and is utilized in accordance therewith; *Provided*, That prior to the execution of the lease, the authorized carrier receives and retains a statement signed by the owner of the equipment, or someone duly authorized to sign for the owner, authorizing the driver to lease the equipment for the movement or movements contemplated by the lease, certifying that the equipment so leased meets the qualifications enumerated in section 204 (f) (1) or (2) of the act, and specifying the origin, destination, and the time of the beginning and ending of the last movement which brought the equipment within the purview of section 204 (f).

These new rules and regulations as published supersede all of the previous ones; the other parts deal with equipment, interchange of equipment, augmenting equipment and contracting requirements, and safety inspection of equipment by the authorized carrier.

## Small Business Administration

LOAN TO FISHERIES COOPERATIVE IN BOSTON:

Approval of a $1,000,000 pool loan to Boston Fisheries Cooperative, Inc., 17 Fish Pier, Boston, Mass., to aid in maintaining the economy of the New England fishing industry was announced December 28, 1956, by the Administrator of the Small Business Administration.

The loan will provide working capital to assist the members of the cooperative to purchase fish during the peak production season, for immediate processing. The fish will be placed in cold storage for orderly marketing during the entire year.

SBA said that the First National Bank of Boston is participating in the loan, and will administer the $1,000,000 as a revolving fund to provide credit when it is needed.

The loan will mature in three years and will carry an interest rate of 5 percent per annum. The loan will be secured by warehouse receipts on the fish in storage. A further provision is that not more than $400,000 of the loan shall be outstanding as of April 1 of each year, to prevent unwarranted accumulation in storage.

## Department of State

LAW OF THE SEA COMMENTED ON:

In an address before the World Affairs Council of Northern California at San Francisco on October 24, 1956, the U. S. State Department's Assistant Secretary for International Organization Affairs commented on the "Law of the Sea" as follows:

"There is another problem that will come up before the General Assembly relating to the law of the sea. You may know that the International Law Commission was authorized by the Assembly to study this matter, and it has now made its final report on four problems--'The Regime of the Territorial Sea,' 'The Regime of the High Seas,' 'The Contiguous Zone,' and 'The Continental Shelf.' This may sound like a very dull matter, but it could be one of the most complicated and highly charged questions the Assembly has to examine. The International Law Commission has recommended that the General Assembly summon an international conference to examine the law of the sea and to draw up such international agreements as it may deem appropriate.

"As you know, we have been having some difficulties off the coasts of Latin America, where a number of states have claimed rights to jurisdiction up to 200 miles from shore and have even interfered with our ships to give effect to these claims.

"For some centuries now the 3-mile limit has prevailed. This dates back to the Dutch jurist Bynkershoek, who contended that it would be sensible to extend, in legal theory at least, the shore limits of a sovereign state out 3 miles because that was the distance a cannon could shoot in those days.

"Meanwhile, some states have supported a 200-mile limit for certain purposes, such as the protection of fishing rights and the riches of the sea. Still other states have been inclined to favor a 12-mile limit.

"This problem involves the issues which revolve around the concept of the continental shelf and the extent to which states should be permitted to have jurisdiction over territorial seas and the submerged oil lands that may lie beneath them.

"We have not formulated any change in our own policy. We adhere to the 3-mile limit as being the soundest basis upon which to operate.

"This is the kind of problem which affects many countries and which quite properly belongs in the United Nations. It is another example of our growing interdependence and the absolute necessity of having an organization like the United Nations consider the conflicting interests of all parties concerned.

"Obviously, if each country were to determine for itself the extent of its jurisdiction over the territorial seas, chaos would result. It would be very much as though each citizen of San Francisco were to draw upon his own set of traffic regulations."

Among the subjects to be considered during the eleventh General Assembly of the United Nations, convened November 12, 1956, will be the "Final Report on the regime of the high seas, the regime of the territorial sea and related problems (resolution 899 (IX) of December 14, 1954)" by the International Law Commission.

## Treasury Department

BUREAU OF CUSTOMS

APPRAISEMENT OF ENTRIES OF FROZEN WHOLE ALBACORE FROM JAPAN WITHHELD:

The Treasury Department has instructed Customs field officers to withhold appraisement of entries of frozen whole albacore from Japan pending investigation to determine whether the albacore is being sold in the United States at less than fair value.

Under the Antidumping Act a determination of sales in the United States at less than fair value would require reference of the case to the Tariff Commission, which would consider whether American industry was being injured. Both dumping price and injury must be shown to justify a finding of dumping under the law.

The two principal steps in an antidumping case are (1) to prove to the Bureau of Customs that the imported article is being sold in the United States at a price that is lower than the freely-offered price in the country of origin or at a price that is lower than the cost of production and (2) to prove to the Tariff Commission that, as a result, the domestic industry is being injured. If both of these findings are made, the Tariff Commission would determine the amount of countervailing duty that would be warranted, and would recommend to the President that he apply such a special duty to the particular shipments subject to investigation. The duty collectible is an amount equal to the difference between such purchase price or exporters sales price and the fair value as may be determined by the Bureau of Customs.

## White House

ASSISTANT SECRETARY OF THE INTERIOR FOR FISH AND WILDLIFE APPOINTED:

The President on January 1, 1957, appointed Ross L. Leffler (assistant to

the executive vice president for operations of United States Steel Corp.) to be the first Assistant Secretary of the Interior for Fish and Wildlife.

Ross L. Leffler

Leffler was born in Butte, Mont., August 7, 1886, and has been very active in civic affairs and has gained considerable prominence for his civic welfare in the State of Pennsylvania and the city of Pittsburg. He was appointed a member of the Pennsylvania Game Commission in 1927, elected president in 1928, served as executive director in 1931; was reappointed to the Commission in 1935, and was elected vice president and president for a second time. He served as a member of the Commission for 28 years, 16 years as president.

He also is a member of the Izaac Walton League and helped to organize the first chapter of that organization in Pennsylvania. He also helped to organize the Federation of Sportsmen's Clubs of Pennsylvania. He is a past president of the International Association of Game Fish and Conservation Commissioners; Atlantic Deeper Waterways Association; a member of the Advisory Committee for the Economic Development of Analysis for Industrial Land and Facilities, Philadelphia; and a member of the Board of Governors, Philadelphia Maritime Authority.

## UNUSUAL FISH TAG RECOVERY

The proverbial "finding a needle in the haystack" became an actuality when a plastic fish tag was returned to the Oregon Fish Commission research laboratory at Astoria, Oregon, in August 1956.

Hundreds of fish tags have been forwarded to the Commission by cooperative citizens in the past, but the "find" of the Skipper of the Marian F., Astoria drag boat, is perhaps the most unusual to date. While sorting a catch of bottom fish taken by his otter-trawl net off the mouth of the Columbia River, the Skipper noticed two red and white discs held together by a silver pin laying on the deck. The tag had apparently caught on the webbing on the net and was dredged up from the deep.

Following the "Return to Oregon Fish Commission" directions on one of the discs, the Skipper learned from biologists that the tag had been put on a 19-inch chinook salmon near the mouth of the Columbia River during a biological study in 1951.

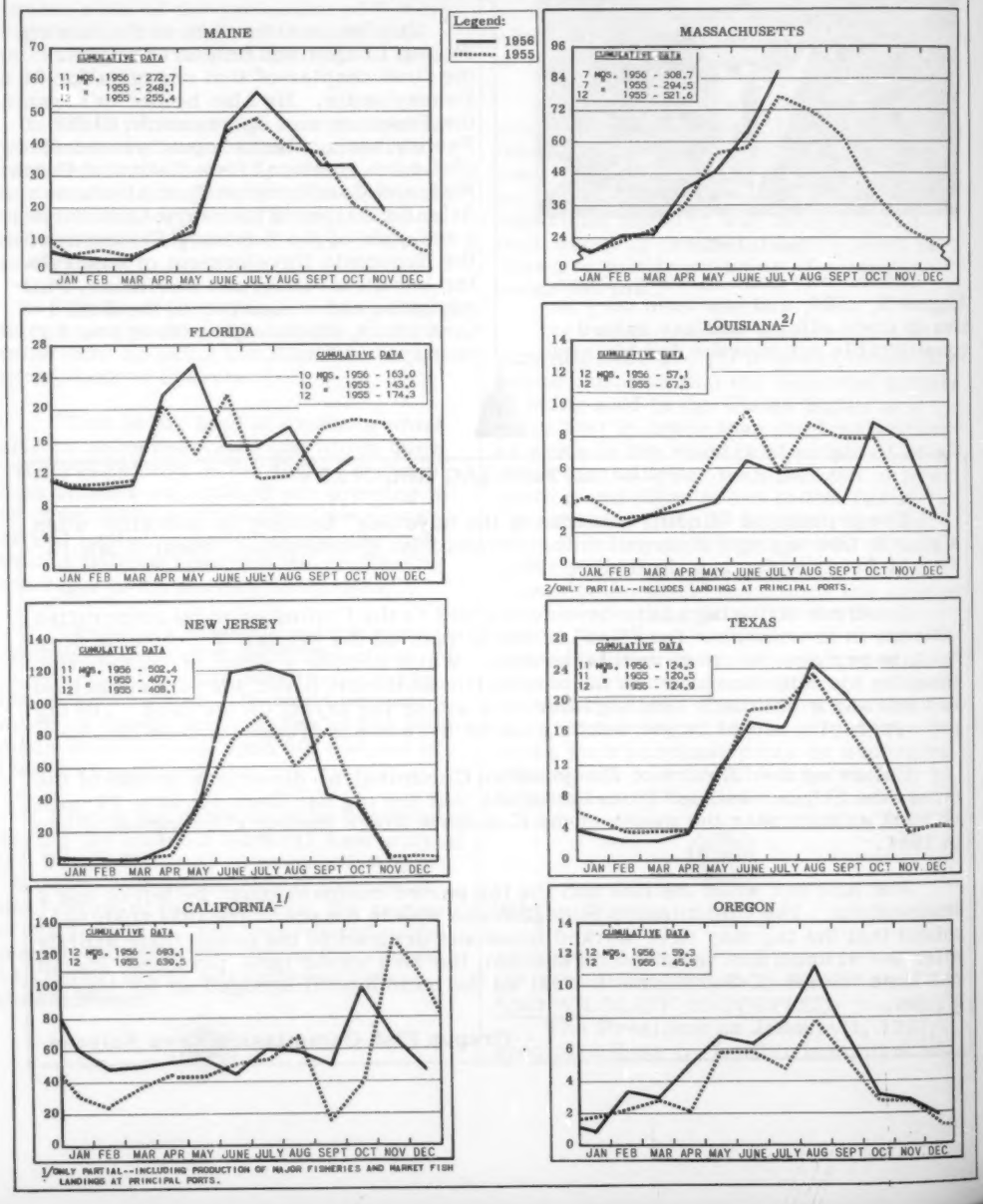
Just how and when the fish and the tag parted company must be left to one's imagination. The Commission biologist who was in charge of the 1951 study surmised that the tag may have worked loose and dropped to the ocean floor shortly after the salmon was released. Then too, the fish could have perished, and in due time the set of discs came to rest on the bottom until dredged up by Marian F. net.

--Oregon Fish Commission News Release

# FISHERY INDICATORS

## CHART 1 - FISHERY LANDINGS for SELECTED STATES

**In Millions of Pounds**

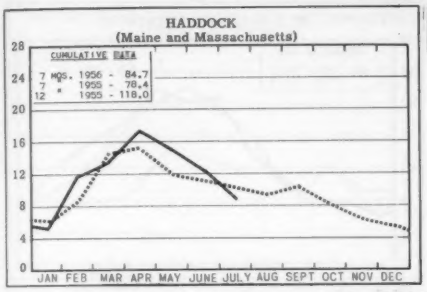



2/ONLY PARTIAL--INCLUDES LANDINGS AT PRINCIPAL PORTS.

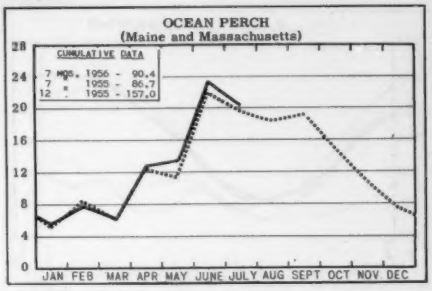
1/ONLY PARTIAL--INCLUDING PRODUCTION OF MAJOR FISHERIES AND MARKET FISH LANDINGS AT PRINCIPAL PORTS.

# CHART 2 - LANDINGS for SELECTED FISHERIES

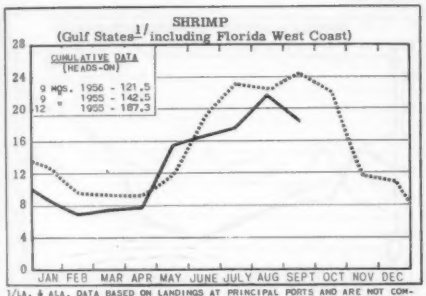
**In Millions of Pounds**

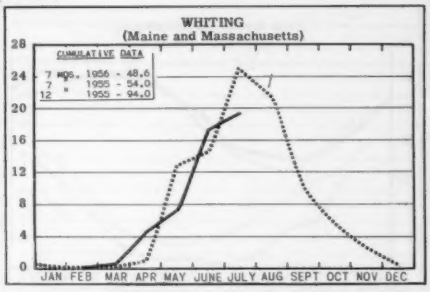

HADDOCK
(Maine and Massachusetts)
CUMULATIVE DATA
7 MOS. 1956 - 84.7
7 " 1955 - 78.4
12 " 1955 - 118.0
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC

Legend:
1956
1955


OCEAN PERCH
(Maine and Massachusetts)
CUMULATIVE DATA
7 MOS. 1956 - 90.4
7 " 1955 - 86.7
12 " 1955 - 157.0
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC

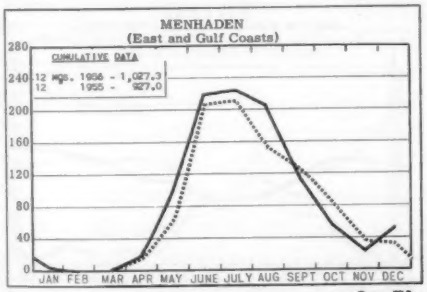
**In Millions of Pounds**

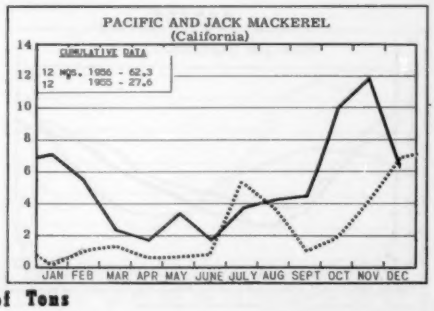

SHRIMP
(Gulf States 1/ including Florida West Coast)
CUMULATIVE DATA
(HEADS-ON)
9 MOS. 1956 - 121.5
9 " 1955 - 142.5
12 " 1955 - 187.3
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC


WHITING
(Maine and Massachusetts)
CUMULATIVE DATA
7 MOS. 1956 - 48.6
7 " 1955 - 54.0
12 " 1955 - 94.0
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC

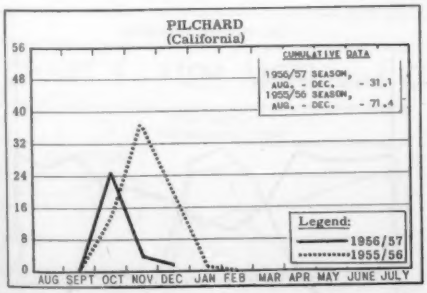
1/LA. & ALA. DATA BASED ON LANDINGS AT PRINCIPAL PORTS AND ARE NOT COMPLETE.

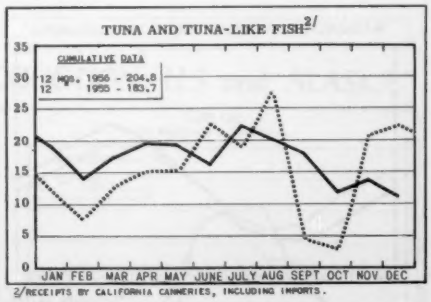
**In Thousands of Tons**


MENHADEN
(East and Gulf Coasts)
CUMULATIVE DATA
12 MOS. 1956 - 1,027.3
12 " 1955 - 927.0
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC


PACIFIC AND JACK MACKEREL
(California)
CUMULATIVE DATA
12 MOS. 1956 - 62.3
12 " 1955 - 27.6
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC

**In Thousands of Tons**

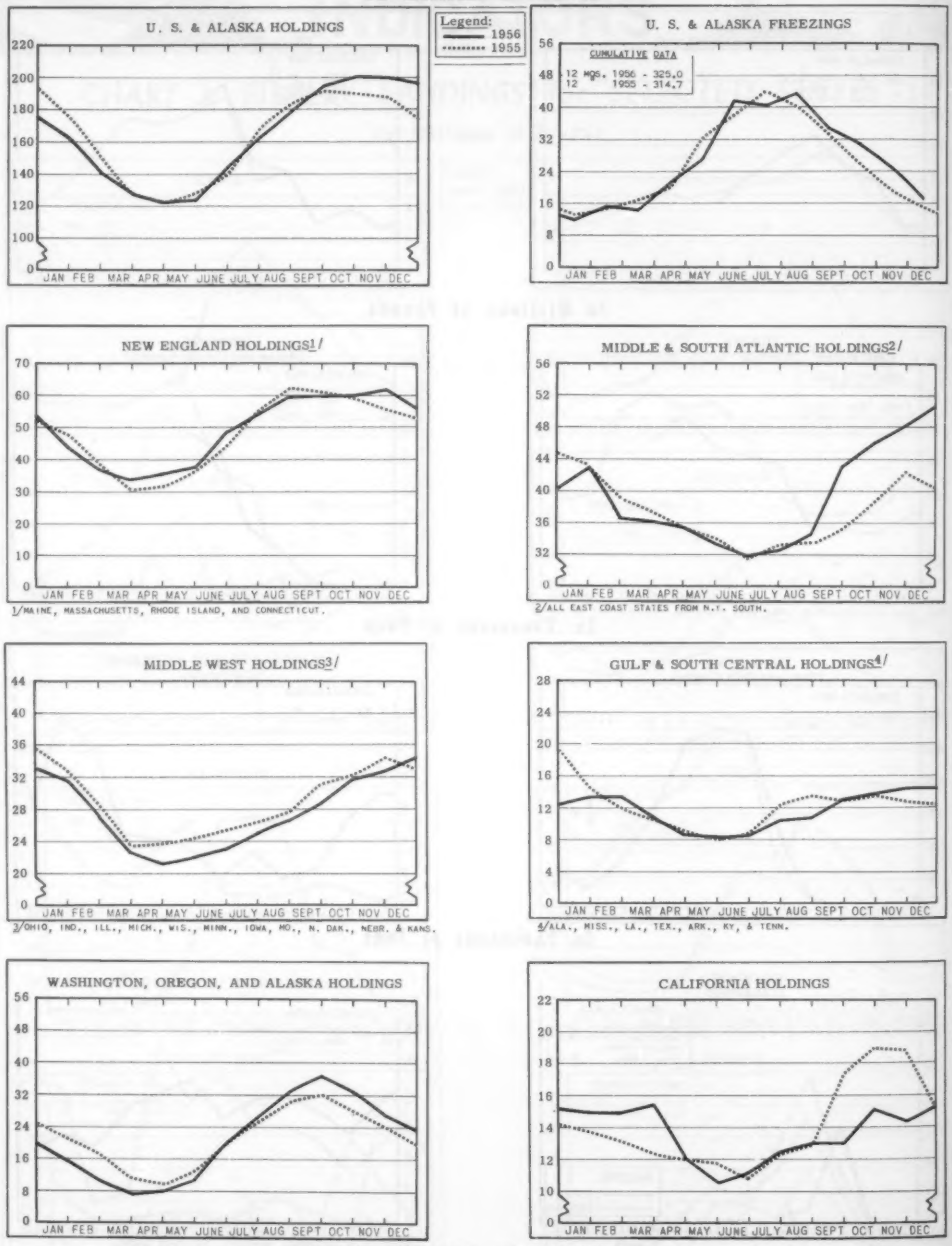



2/RECEIPTS BY CALIFORNIA CANNERIES, INCLUDING IMPORTS.

# CHART 3 - COLD-STORAGE HOLDINGS and FREEZINGS of FISHERY PRODUCTS *

**In Millions of Pounds**


U. S. & ALASKA HOLDINGS
Legend:
1956
1955
U. S. & ALASKA FREEZINGS
CUMULATIVE DATA
12 MOS. 1956 - 325.0
12 " 1955 - 314.7
NEW ENGLAND HOLDINGS1/
MIDDLE & SOUTH ATLANTIC HOLDINGS2/
MIDDLE WEST HOLDINGS3/
GULF & SOUTH CENTRAL HOLDINGS4/
WASHINGTON, OREGON, AND ALASKA HOLDINGS
CALIFORNIA HOLDINGS
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC

1/MAINE, MASSACHUSETTS, RHODE ISLAND, AND CONNECTICUT.

2/ALL EAST COAST STATES FROM N.Y. SOUTH.

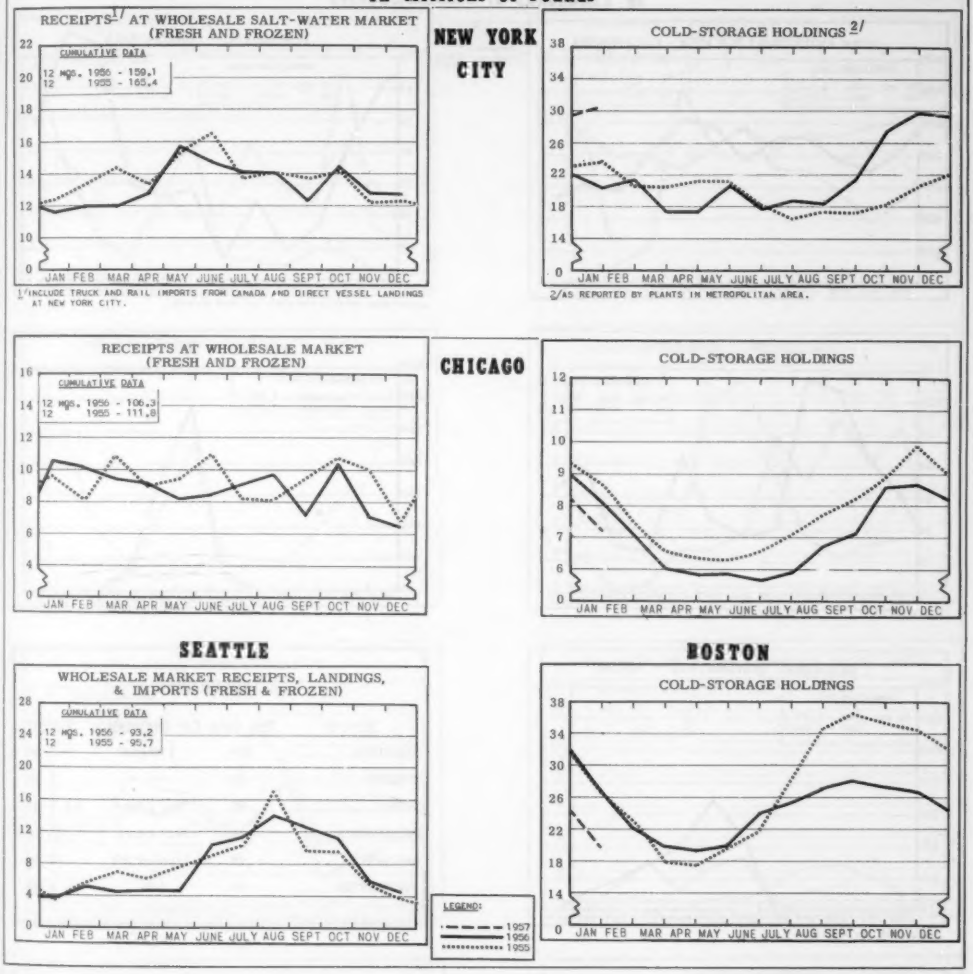
3/OHIO, IND., ILL., MICH., WIS., MINN., IOWA, MO., N. DAK., NEBR. & KANS.

4/ALA., MISS., LA., TEX., ARK., KY, & TENN.

*Excludes salted, cured, and smoked products.

## CHART 4 - RECEIPTS and COLD-STORAGE HOLDINGS of FISHERY PRODUCTS at PRINCIPAL DISTRIBUTION CENTERS

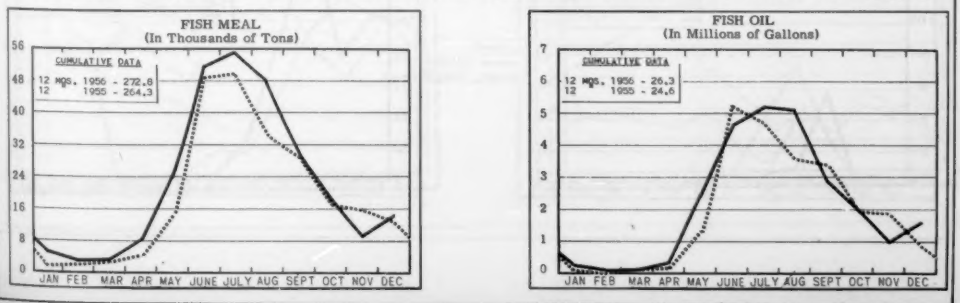
**In Millions of Pounds**




1/ INCLUDE TRUCK AND RAIL IMPORTS FROM CANADA AND DIRECT VESSEL LANDINGS AT NEW YORK CITY.

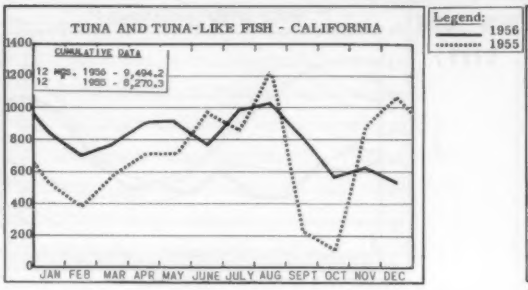
2/ AS REPORTED BY PLANTS IN METROPOLITAN AREA.

## CHART 5 - FISH MEAL and OIL PRODUCTION - U.S and ALASKA

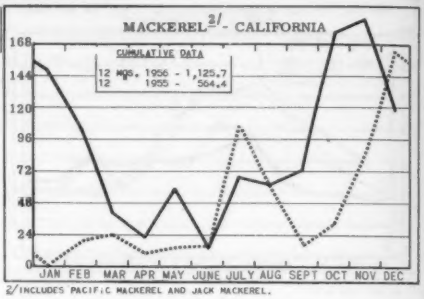

FISH MEAL
(In Thousands of Tons)
CUMULATIVE DATA
12 MOS. 1956 - 272.8
12 1955 - 264.3
FISH OIL
(In Millions of Gallons)
CUMULATIVE DATA
12 MOS. 1956 - 26.3
12 1955 - 24.6
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC

# CHART 6 - CANNED PACKS of SELECTED FISHERY PRODUCTS

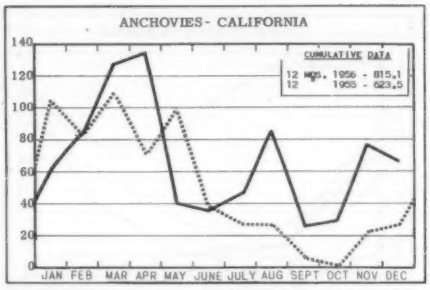
**In Thousands of Standard Cases**

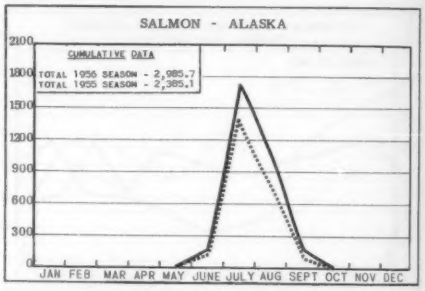


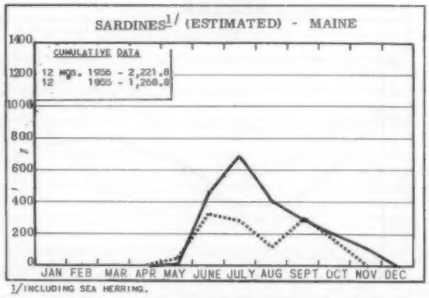

Legend:
1956
1955




2/ INCLUDES PACIFIC MACKEREL AND JACK MACKEREL.



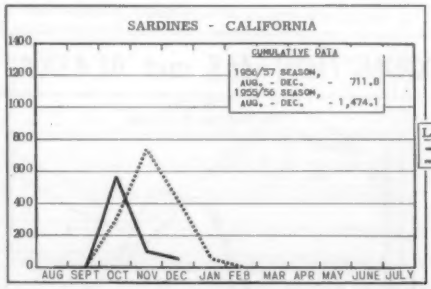



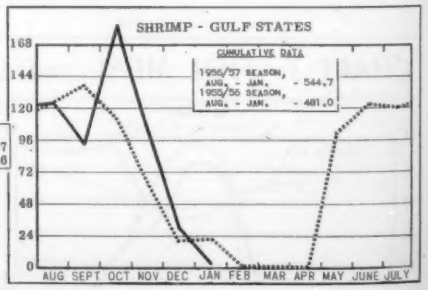

1/ INCLUDING SEA HERRING.

**STANDARD CASES**

| Variety | No. Cans | Can Designation | Net Wgt. |
|---|---|---|---|
| SARDINES ..... | 100 | ¼ drawn | 3¾ oz. |
| SHRIMP..... | 48 | -- | 5 oz. |
| TUNA ..... | 48 | No. ½ tuna | 6 & 7 oz. |
| PILCHARDS ..... | 48 | No. 1 oval | 15 oz. |
| SALMON ..... | 48 | 1-pound tall | 16 oz. |
| ANCHOVIES ..... | 48 | ½ lb. | 8 oz. |

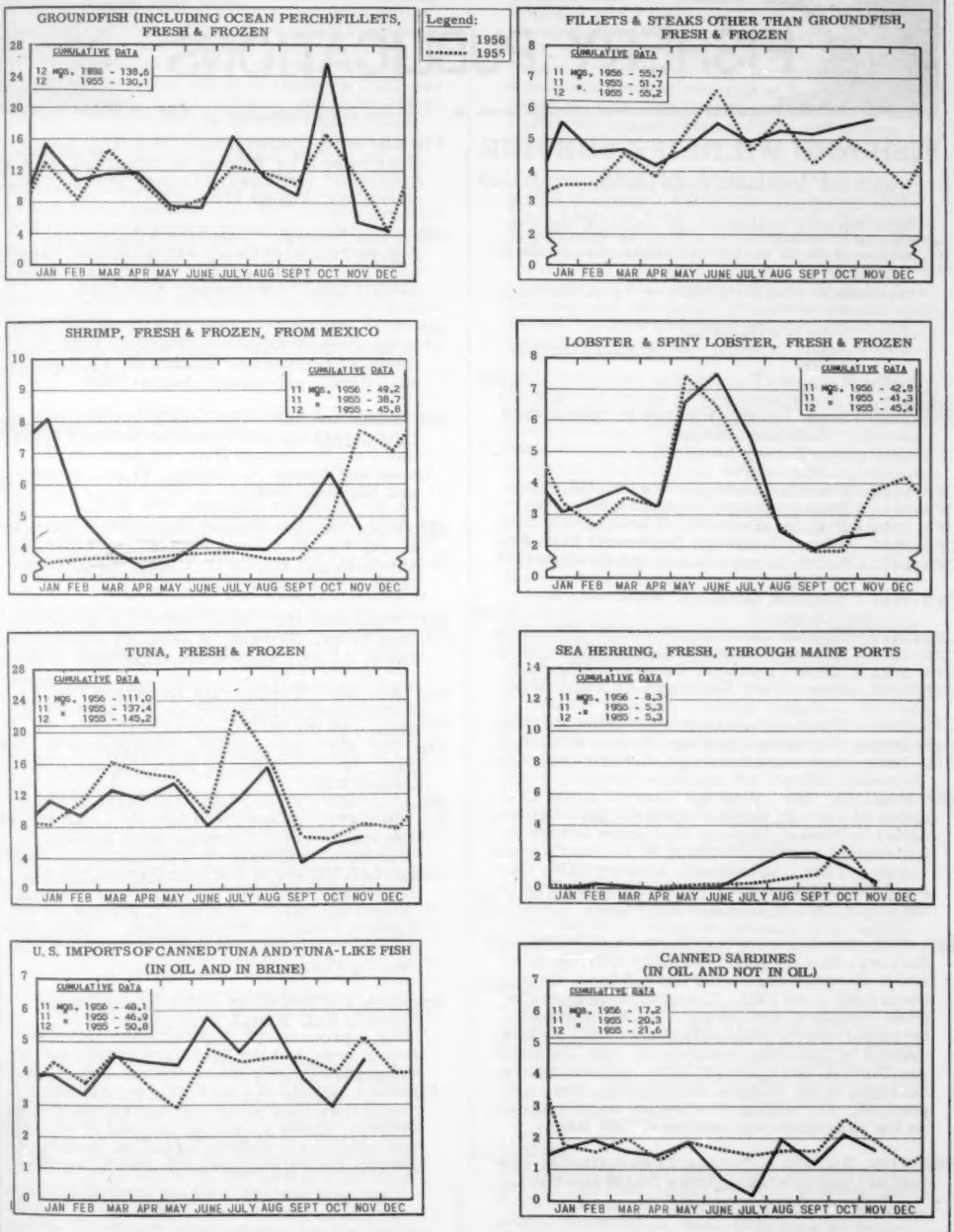


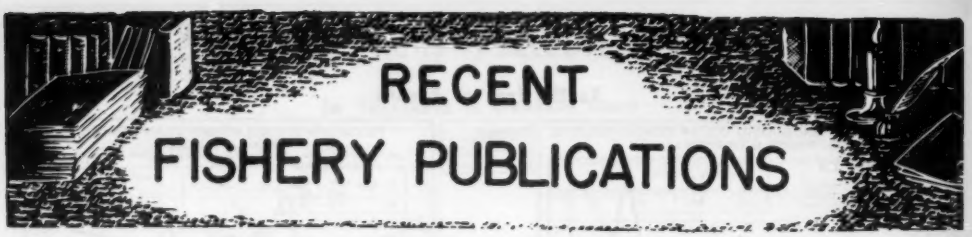

Legend:
1956/57
1955/56



# CHART 7 - U.S. FISHERY PRODUCTS IMPORTS

**In Millions of Pounds**


GROUNDFISH (INCLUDING OCEAN PERCH) FILLETS, FRESH & FROZEN
CUMULATIVE DATA
12 MOS. 1956 - 138.6
12 " 1955 - 130.1
Legend:
1956
1955
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC
FILLETS & STEAKS OTHER THAN GROUNDFISH, FRESH & FROZEN
CUMULATIVE DATA
11 MOS. 1956 - 55.7
11 " 1955 - 51.7
12 " 1955 - 55.2
SHRIMP, FRESH & FROZEN, FROM MEXICO
CUMULATIVE DATA
11 MOS. 1956 - 49.2
11 " 1955 - 38.7
12 " 1955 - 45.8
LOBSTER & SPINY LOBSTER, FRESH & FROZEN
CUMULATIVE DATA
11 MOS. 1956 - 42.9
11 " 1955 - 41.3
12 " 1955 - 45.4
TUNA, FRESH & FROZEN
CUMULATIVE DATA
11 MOS. 1956 - 111.0
11 " 1955 - 137.4
12 " 1955 - 145.2
SEA HERRING, FRESH, THROUGH MAINE PORTS
CUMULATIVE DATA
11 MOS. 1956 - 8.3
11 " 1955 - 5.3
12 " 1955 - 5.3
U. S. IMPORTS OF CANNED TUNA AND TUNA-LIKE FISH (IN OIL AND IN BRINE)
CUMULATIVE DATA
11 MOS. 1956 - 48.1
11 " 1955 - 46.9
12 " 1955 - 50.8
CANNED SARDINES (IN OIL AND NOT IN OIL)
CUMULATIVE DATA
11 MOS. 1956 - 17.2
11 " 1955 - 20.3
12 " 1955 - 21.6




## FISH AND WILDLIFE SERVICE PUBLICATIONS

THESE PROCESSED PUBLICATIONS ARE AVAILABLE FREE FROM THE DIVISION OF INFORMATION, U. S. FISH AND WILDLIFE SERVICE, WASHINGTON 25, D. C. TYPES OF PUBLICATIONS ARE DESIGNATED AS FOLLOWS:

CFS - CURRENT FISHERY STATISTICS OF THE UNITED STATES AND ALASKA.
SSR.- FISH. - SPECIAL SCIENTIFIC REPORTS - FISHERIES (LIMITED DISTRIBUTION).
SEP.- SEPARATES (REPRINTS) FROM COMMERCIAL FISHERIES REVIEW.

Number Title

CFS-1437 - South Atlantic Fisheries, 1955 Annual Summary, 10 pp.
CFS-1440 - New Jersey Landings, September 1956, 4 pp.
CFS-1441 - Florida Landings, August 1956, 6 pp.
CFS-1444 - Ohio Landings, October 1956, 2 pp.
CFS-1445 - Fish Meal and Oil, October 1956, 2 pp.
CFS-1446 - Shrimp Landings, September 1956, 4 pp.
CFS-1447 - North Carolina Landings, October 1956, 2 pp.
CFS-1448 - Alabama Landings, September 1956, 2 pp.
CFS-1449 - Florida Landings, September 1956, 6 pp.
CFS-1450 - Georgia Landings, October 1956, 2 pp.
CFS-1452 - Texas Landings, October 1956, 3 pp.
CFS-1453 - New Jersey Landings, October 1956, 4 pp.
CFS-1454 - Rhode Island Landings, July 1956, 3 pp.
CFS-1455 - California Landings, August 1956, 4 pp.
CFS-1456 - New York Landings, October 1956, 4 pp.

SSR-Fish. No. 169 - Average Year's Fishing Condition of Tuna Longline Fisheries, 1952 Edition, edited by Nankai Regional Fisheries Research Laboratory and translated by W. G. Van Campen, 133 pp., illus., processed, January 1956. Observations of the albacore fishing conditions in the North Pacific area are presented.

SSR-Fish. No. 173 - Central North Pacific Albacore Surveys, January 1954-February 1955, by Richard S. Shomura and Tamio Otsu, 34 pp., illus., processed, June 1956. Contains fishing results from 7 exploratory cruises in the North Pacific between January 1954 and February 1955, supplemented by Japanese commercial long-line catch data for the same period. Also included are discussions of the vertical distribution, sex composition, and tagging of albacore as well as data on the miscellaneous species of fish taken.

SSR-Fish. No. 178 - Physical Oceanographic, Biological, and Chemical Data - South Atlantic Coast of the United States, M/V Theodore N. Gill Cruise 1, by William W. Anderson, Jack W. Gehringer, and Edward Cohen, 160 pp., illus., processed, August 1956.

SSR-Fish. No. 182 - Japanese Albacore and Bigeye Tuna Size Composition Studies, translated from the Japanese by W. G. Van Campen, 48 pp., illus., processed, June 1956.

SSR-Fish. No. 184 - Longline Fishing for Tuna in the Central Equatorial Pacific, 1954, by Edwin S. Iversen and Howard O. Yoshida, 33 pp., illus., processed, August 1956.

SSR-Fish. No. 185 - Blueback Salmon (Oncorhynchus nerka) Age and Length at Seaward Migration Past Bonneville Dam, by Raymond E. Anas and Joseph R. Gauley, 46 pp., processed, October 1956.

SSR-Fish. No. 190 - Saury Distribution and Abundance, Pacific Coast, 1950-55, by Elbert H. Ahlstrom and Harold D. Casey, 69 pp., processed, November 1956.

SSR-Fish. No. 191 - Shad Fishery of the Ogeechee River, Georgia, in 1954, by James E. Sykes, 11 pp., processed, November 1956.

Sep. No. 460 - Preliminary Results of Deep-Water Exploration for Shrimp in the Gulf of Mexico by the M/V Oregon (1950-1956).
Sep. No. 461 - Iron Sulfide Discoloration of Tuna Cans, No. 4 - Effect of Retorting and Cooling Canned Fish.
Sep. No. 462 - Pilot-Plant Fish-Meal Dryer.
Sep. No. 463 - Research in Service Laboratories (December 1956): Contains these articles--- "Variation in Proximate Composition of Right and Left Fillets of Rockfish (Sebastodes piniger) and Dover Sole (Microstomus pacificus)," "Fish Composition Studies," "Antibiotics for Fishery Products Preservation," "Tech. Note No. 35 - Improved Workmen's Stand for Processing Plants."

Research and Activities Under the Saltonstall-Kennedy Act, Fiscal Year 1956, 194 pp., illus., processed. A generously illustrated annual report of the Secretary of Interior to Congress. Briefly discusses the Act and its history, the American Fisheries Advisory Committee, and programs and allocations for 1956/57. Gives a detailed account of activities and progress in fishery biological studies of: salmon and related species; Pacific sardine;

ocean research; North Atlantic trawl fishes; Atlantic herring; Gulf of Mexico fishes; striped bass investigations; menhaden research; culture of commercial mollusks; control of oyster predators and drills; Gulf of Mexico oyster drills; albacore research; and commercial propagation of channel catfish. Also lists contracts completed as of June 30, 1956, and gives abstracts and detailed reports on commercial fishery studies of: exploratory fishing and gear research (includes North Atlantic, South Atlantic, and Gulf of Mexico explorations; Maine sardine explorations; and gear development and research) and fishery technological studies (includes Middle Atlantic and Gulf research; development of voluntary standards; chemical index for nutritive value of fish meal, and new uses for and new products from fish meal; improvement in quality of skipjack tuna; and survey of Great Lakes and Mississippi Valley fresh-water fishery). Brief reports are included on commercial fishery economic studies and statistics, and fishery education, market development, and Market News Service. Thirteen appendixes list acts, minutes of meetings, and outlines referred to throughout the report.

THE FOLLOWING SERVICE PUBLICATIONS ARE AVAILABLE ONLY FROM THE SPECIFIC OFFICE MENTIONED.

Landings and Receipts of Fishery Products at Seattle, 1955, and Landings and Receipts of Fishery Products at Astoria, Oregon, 1955, by Charles M. Reardon, 37 pp., processed, 1956. (Available free from Market News Service, U.S. Fish and Wildlife Service, 421 Bell St. Terminal, Seattle 1, Wash.) The Pacific Northwest fisheries trends and their effect upon Seattle fishery products receipts for 1955 are discussed in the first part of this report. This section covers total receipts of fishery products at Seattle; sources of supply of frozen and fresh fishery products; trends in Seattle receipts of salmon, halibut, tuna, otter-trawl and long-line landings, shellfish, livers, liver oils, herring meal, and other miscellaneous fishery products. The tables present fishery landings and wholesale receipts (including approximate values) at Seattle for 1955 by species, source of origin, and by months; monthly index of receipts of certain fishery products at Seattle; carload shipments of fishery products from Seattle by months, and names, classifications, and approximate standards for fresh and frozen fishery products sold on the Seattle market. The Astoria Section includes a discussion of fisheries trends and fishery products receipts at Astoria, Ore., for 1955. This section covers the Columbia River gill-net fishery, troll and otter-trawl fisheries, and landings and wholesale receipts of fishery products at Astoria during 1955.

Boston Fishery Products Monthly Summary, November 1956, 15 pp.; Boston Fishery Products Monthly Summary, December 1956, 15 pp. (Market News Service, U.S. Fish and Wildlife Service, 10 Commonwealth Pier, Boston 10, Mass.) Landings and ex-vessel prices by species for fares landed at the Boston Fish Pier and sold through the New England Fish Exchange; and Boston frozen fishery products prices to primary wholesalers; for the months indicated.

California Fishery Products Monthly Summary, October 1956, 10 pp.; California Fishery Products Monthly Summary, November 1956, 10 pp. (Market News Service, U.S. Fish and Wildlife Service, Post Office Bldg., San Pedro, Calif.) California cannery receipts of raw tuna and tunalike fish, herring, mackerel, anchovies, and squid; pack of canned tuna, mackerel, herring, anchovies, and squid; market fish receipts at San Pedro, Santa Monica, San Diego, and Eureka areas; California imports; canned fish and frozen shrimp prices; for the months indicated.

Gulf Monthly Landings, Production, and Shipments of Fishery Products, November 1956, 5 pp. (Market News Service, U.S. Fish and Wildlife Service, 609-611 Federal Bldg., New Orleans 12, La.) Gulf States shrimp, oyster, finfish, and blue crab landings; crab meat production; LCL express shipments from New Orleans; and wholesale prices of fish and shellfish on the New Orleans French Market; for the month indicated.

Monthly Summary of Fishery Products Production in Selected Areas of Virginia, North Carolina, and Maryland, November 1956, 4 pp. (Market News Service, U.S. Fish and Wildlife Service, 18 S. King St., Hampton, Va.) Fishery production for the Virginia areas of Hampton Roads, Lower Northern Neck, and Eastern Shore; the Maryland areas of Crisfield, Ocean City, and Cambridge; and the North Carolina areas of Atlantic, Beaufort, and Morehead City; together with cumulative and comparative data; for the month indicated.

(Seattle) Monthly Summary - Fishery Products, November 1956, 6 pp.; (Seattle) Monthly Summary - Fishery Products, December 1956, 6 pp. (Market News Service, U.S. Fish and Wildlife Service, 421 Bell St. Terminal, Seattle, 1, Wash.) Includes landings and local receipts, with ex-vessel and wholesale prices in some instances, as reported by Seattle and Astoria (Oregon) wholesale dealers; also Northwest Pacific halibut landings; for months indicated.

## MISCELLANEOUS PUBLICATIONS

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM. CORRESPONDENCE REGARDING PUBLICATIONS THAT FOLLOW SHOULD BE ADDRESSED TO THE RESPECTIVE ORGANIZATION OR PUBLISHER MENTIONED. DATA ON PRICES, IF READILY AVAILABLE, ARE SHOWN.

ARCTIC:

The Plankton of the Beaufort and Chukchi Sea Areas of the Arctic and its Relation to the Hydrography, by Martin W. Johnson, Technical Paper no. 1, 32 pp., illus., printed, 50 Canadian cents. Arctic Institute of North America, 3485 University St., Montreal 2, Que., Canada, July 1956.

ALMANAC:

The American Ephemeris and Nautical Almanac for the Year 1958, 593 pp., printed, $4. Nautical Almanac Office, U.S. Naval Observatory, Washington, D.C. (For sale by Superintendent of Documents, Government Printing Office, Washington 25, D.C.)

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

BARBADOS:

Memorandum on the Barbados Fishing Industry for Consideration by the Marketing Committee, 29 pp., printed. Department of Science and Agriculture, Barbados, B.W.I., 1954.

CANADA:

Fisheries Statistics of Canada, 1954 (British Columbia), 14 pp., illus., printed in French and English, 25 Canadian cents. Department of Trade and Commerce, Dominion Bureau of Statistics, Ottawa, Canada. Contains tables giving the quantity and value of fishery products landed in British Columbia in 1951-54, by species and by fisheries districts; quantity and value of manufactured fishery products for 1953-54; capital equipment in the primary fisheries operations; and the number of fishermen engaged in the primary fisheries operations.

Fisheries Statistics of Canada - Newfoundland, 1954, 4 pp., illus., printed in French and English. Dominion Bureau of Statistics, Industry and Merchandising Division, Fisheries Section, Ottawa, Canada, 1956. Presents statistical data on the Newfoundland fishery. Tables show quantity and value of the principal species; capital equipment in the primary fishery operations; and number of persons engaged in the fisheries.

Fisheries Statistics of Canada, 1954 (Prince Edward Island), 22 pp., illus., printed in French and English, 25 Canadian cents. Department of Trade and Commerce, Dominion Bureau of Statistics, Ottawa, Canada. Contains tables giving the quantity and value of fishery products landed in Prince Edward Island in 1954-54, by species and by fisheries districts; quantity and value of manufactured fishery products for 1953-54; capital equipment in the primary fisheries operations; and the number of fishermen engaged in the primary fishery operations.

Progress Reports of the Atlantic Coast Stations, Atlantic Progress Reports no. 65, 26 pp., illus., printed in French and English. Fisheries Research Board of Canada, Ottawa, Canada, October 1956. Contains the following articles: "Oyster Mortalities, Old and New, in the Maritimes," by R. R. Logie; "Effect of Freezing on Coliform Bacteria and Method of Detection in Frozen Fish Fillets and Blocks," by H. P. Dussault; "Difficulties in Grading Smelt," by R. A. McKenzie; "The Bile Acids of Cod Bile," by L. C. Dugal and A. Laframboise; and "Acid Encilage from Cod and Haddock Offal," by H. C. Freeman and P. L. Hoogland.

COD:

Samples of Cod from the Convention Area 1952-55, Reported to the Commission, Length Distribution, by Erik M. Poulsen, Serial no. 426, 19 pp., processed. International Commission for the Northwest Atlantic Fisheries, Forest Bldg., Carleton St., Halifax, N. S., Canada, November 1956.

COOKERY:

Some Oyster Recipes, by Helen Evans Brown, 28 pp., illus., printed. Ampersand Press, Pasadena, Calif., 1951.

EELS:

"The Eel Fisheries of Virginia," by James Wharton, article, The Commonwealth, vol. XXIII, no. 11, November 1956, pp. 20-21, illus., printed, 25 cents. Virginia State Chamber of Commerce, 111 N. Fifth St., Richmond 19, Va. Briefly discussed are the apathy to Virginia eel in Virginia; methods of eel fishing; some reasons for the lack of eel on American menus; history of eel-eating; some misconceptions about eels; and suggestions for cooking eels.

ELECTRO-FISHING:

"Catches of Fish in New Brunswick Streams by Direct Current Electro-Fishing," by H. Godfrey, article, The Canadian Fish Culturist, issue nineteen, November 1956, pp. 1-8, printed. Department of Fisheries, Ottawa, Canada. Discusses investigations made with direct current electrical fishing gear; how fishing was carried out; and what fish were captured. Included are descriptions of tables that show differences in behaviour within the electrical field and in catchability of the more abundant species such as eels, salmon fry, "black-nosed" dace, sculpin, burbot, and others.

FISHERIES MANAGEMENT:

Concerning the Biological Basis of the Rate of Exploitation, and Means of Managing the Abundance of Fish Stocks, by G.V. Nikolsky, 16 pp., processed. (Preliminary translation by W.E. Ricker from Ocherki po Obshchim Voprosam Ikhtiologii (Essays on General Problems of Ichthyology), 1953, pp. 306-318). Fisheries Research Board of Canada, Biological Station, Nanaimo, B.C., Canada.

FISH SAUCES AND PASTES:

"Fish Sauces and Pastes Are Palatable and Nourishing," by H.S. McKee, article, SPC Quarterly Bulletin, vol. 6, no. 4, October 1956, pp. 16-17, illus., printed. South Pacific Commission, Box 5254, G.P.O., Sydney, Australia. Describes the manufacture of fish sauces and pastes utilizing supplies of fish that would otherwise be wasted. Fish sauces and pastes offer a simple way of reinforcing protein-deficient diets such as are often found in the South Pacific.

FISHWAYS AND FISH PROTECTION DEVICES:

Fish and Wildlife Appendix C of Report to the Water Project Authority of the State of California on Feasability of Construction by the State of Barriers in the San Francisco Bay System, 59 pp., illus., printed. Department of Public Works, Division of Water Resources, P.O. Box 1079, Sacramento, Calif., June 1955. Discusses fish species that would be affected by a salinity barrier, probable effect of such a barrier on fisheries and wildlife together with problems of individual species, an economic evaluation of the fisheries and wildlife resources, and fishways and fish protection devices.

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

FOOD AND AGRICULTURE ORGANIZATION:

Yearbook of Fishery Statistics (Annuaire Statistique des Peches, Anuario Estadistico de Pesca)--Production and Fishing Craft (Production et Bateaux de Peche, Produccion y Embarcaciones de Pesca), 1954-55, vol. 5, 390 pp., illus., processed, US$4. Food and Agriculture Organization of the United Nations, Rome, Italy, 1956. (Sold in the United States by Columbia University Press, International Documents Service, 2960 Broadway, New York 27, N.Y.) This latest edition of the FAO Yearbook includes statistics from more than 150 countries and territories, given in 72 tables and, for the first time, important summary data are shown in diagrammatic form. Detailed tables are given for 73 selected countries which land about 75 percent of the world catch. Data available from USSR are given, broken down by species and administrative units. If the Soviet Union is added to the 73 selected countries, the details cover about 84 percent of the world catch. The Yearbook is arranged in eight sections, A to H. The first four (A, B, C, and D) give details of catch and landings. Section E gives disposition of the catch and F shows production of preserved and processed commodities. Section G deals with fishing craft and section H with the whale catch. Notes and glossaries of English, French, and scientific names of fish provide interesting and valuable background and explanatory information. The Yearbook has been enlarged and contains more detailed information than was found in previous issues. The text throughout is printed in English and French, with the Introduction, Notes, and Section titles also given in Spanish. There are five new tables of statistics in this edition. The first, A-5, shows the world catch and landings by countries arranged by regions, thus providing comparable figures for the regions. B-2, which gives catch and landings in quantities by groups of species and by countries, is also a new table. (The continental totals have been summarized in table B-1.) F-1, a summary of production of preserved and processed commodities in selected countries, is another new table, and so are H-1 and 2, which provide statistics of the catch of whales by whaling areas and by countries and whaling areas. As the foreword states, the inclusion of more information "has been made possible partly by improvements in the basic data obtained, including previously unavailable official or semi-official figures for some countries, and partly by a more extended use of estimates in the calculation of totals."

GEAR:

"Mechanical Shellfish Digger Developed," by L.M. Dickie and J.S. McPhail, article, World Fishing, vol. 5, no. 11, November 1956, pp. 49-51, illus., printed. John Trundell Ltd., Temple Avenue, London, E.C.4, England. Describes the operation and trials of the mechanical shellfish digger and the prospects of using this method of gathering clams in Canada. At present it is illegal to use any but hand-tool methods for digging soft-shell clams in the Maritime Provinces and Quebec.

"The Newfoundland Cod Traps," by Mark Ronayne, article, Trade News, vol. 9, no. 4, October 1956, pp. 3-7, illus., printed. Director of Information and Educational Service, Department of Fisheries, Ottawa, Canada. Describes in detail the evolution of the cod trap from its invention 91 years ago to its present day rating as one of the most efficient fishing devices. The author discusses the history of cod traps and cod fishing; the basic structure of the cod trap; sizes and uses of cod traps; the briefness of the cod trapping season; advantages in using the trap skiff; and others.

A New Mid-Water Trawl for Herring, by W.E. Barraclough and W.W. Johnson, Bulletin no. 104, 25 pp., illus., printed. Fisheries Research Board of Canada, Publications Office, Ottawa, Canada, 1956.

GENERAL:

"The Choice and Solution of Mathematical Models for Predicting and Maximizing the Yield of a Fishery," by Kenneth E.F. Watt, article, Journal of the Fisheries Research Board of Canada, vol. 13, no. 5, October 1956, pp. 613-645, printed. Queen's Printer, Hull, Que., Canada. The great expense of modern fisheries research programs necessitates, prior to data collection, careful consideration of the mathematical model to be used in analysis. The simplest type of model requires little information, but has poor predictive reliability. Progressively more complex models have higher information output, in the form of predictive reliability and insight into dynamics of the exploited population, but require higher information input, not only as amount of data, but array of types of data. The general form of the most complex type of model is derived by consideration of available information on the dynamics of fish populations. The specific form of the component terms and the values of the parameters must be derived in each instance through a combination of deduction and joint regression analysis. To solve the models, catch-effort data must be weighted to avoid gross errors, all readable scales must be aged, regardless of difficulty in interpretation, and various modifications of the theory and practice of tag-recapture programs are necessary. Schooling behavior and regenerated scale centers influence necessary minimum size of scale sample.

The Distribution of Fishes Found Below a Depth of 2000 Meters, by Marion Grey, Fieldiana: Zoology, vol. 36, no. 2, pp. 75-337, printed. Chicago Natural History Museum, Chicago, Ill., July 1956.

The Effect of Hydroelectric Developments on the Fishery Resources of Snake River; A Final Report, by Robert B. Irving and Paul Cuplin, 169 pp., illus., printed. Idaho Department of Fish and Game, 518 Front St., Boise, Idaho, 1956.

Tax Guide for Small Business, printed, 30 cents. Internal Revenue Service, Washington, D.C., 1956. (For sale by Superintendent of Documents, Government Printing Office, Washington 25, D.C.)

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

GERMANY:

"Development of the West German Fishing Industry," by Gerhard Meseck, article, Progress, vol. 45, no. 251, Summer 1956, pp. 138-144, illus., printed. Associated Enterprises Limited, Unilever House, Blackfriers, London, E.C. 4, England. One of the most striking examples of the rebuilding of Germany's industrial strength is provided by the Federal Republic's fishing industry. The fleet has been largely replaced and a great advance made in equipment and techniques for the processing and marketing of catches. This is a survey of what has been achieved and is planned for the West German fishing industry.

INTERNATIONAL COMMISSIONS:

(International North Pacific Fisheries Commission) Annual Report, 1955, 67 pp., illus., printed. University of British Columbia, 209 Westbrook Bldg., Vancouver 8, B.C., Canada, 1956. A report in three parts containing summaries of research carried out for the Commission by research agencies of its three member nations, Canada, Japan, and the United States. Part I, Report of the 1955 Annual Meeting, covers only preliminary material since analysis of data from 1955 investigations was far from complete at the end of that year. Part II, Administrative Report, gives a very brief account of membership changes, publications, and fiscal status of the Commission. Part III, The Research Program, reports on the concentrated program to determine the continental origin of stocks of salmon on the high seas and whether there is a need for joint conservation measures for the king crab stock of the eastern Bering Sea.

JAPAN:

Bulletin of Tokai Regional Fisheries Research Laboratory, no. 13, 90 pp., illus., printed in Japanese with English summaries. Tokai Regional Fisheries Research Laboratory, Tsukishima, Chuo-ku, Tokyo, Japan, June 1956. Contains, among others, the following articles: "Report on Sampling Survey for 'Iwashi' Catch and Fishing Effort;" "Body Length Distribution of the Japanese Anchovy, Engraulis japonica in Ise Bay, Mikawa Bay and Ensyu-Nada - I. Body Length in 1951 and 1952;" "Effect of Supersonic Wave on Behavior of Fish;" "Studies on the Breaking Strength of Netting Cords Made with Various Twisting Machines;" and "Relationship Between Jelly Strength and Chemical Composition of Fish Meat Jelly."

Japanese Fisheries, 133 pp., illus., printed. Sangyo Keizai Shimbun, Tokyo, Japan, 1955.

MALTA:

A Report on the Fishing Industry of Malta, by T. W. Burdon, 79 pp., illus., printed. Government Printing Office, Malta, 1956.

MAURITANIA:

La peche d'outre mer - Mauritanie (Overseas Fishing - Mauritania), by R. Moal, Science et Peche, vol. 1, no. 28, September 1955, 6 pp. printed in French. Institut Scientifique et Technique des Peches Maritimes, 59 av. R. Poincare, Paris 16, France.

OCEANOGRAPHY:

NORPAC 1955, M/V "Brown Bear," August 1 to September 19, 1955, Preliminary Data Report, by Richard H. Fleming and staff, Special Report no. 22, 104 pp., processed. University of Washington, Department of Oceanography, Seattle 5, Wash., February 1956.

OYSTERS:

Effects of Two Parasites on the Growth of Oysters, by R. Winston Menzel and Sewell H. Hopkins, 3 pp., processed. (Reprinted from Proceedings of the National Shellfish Association, vol. 45, 1954, pp. 184-186.) Department of Biology, A.&M. College of Texas, College Station, Tex.

Factors Controlling the Distribution of Oysters in a Neutral Estuary, by Nelson Marshall, 6 pp., illus., printed. (Reprinted from Ecology, vol. 35, no. 3, July 1954, pp. 322-327.) Oceanographic Institute, Florida State University, Tallahassee, Fla.

"Oil and Oysters," by James N. McConnell, article, Louisiana Conservationist, vol. 8, no. 11, October 1956, pp. 4-6, illus., printed. Louisiana Conservationist, 126 Civil Courts Bldg., New Orleans 16, La. Discusses the problems of continuing oyster production in areas where mineral activity, especially oil drilling, is increasing.

Some Phases of the Biology of OSTREA EQUESTRIS Say and a Comparison with CRASSOSTREA VIRGINICA (Gmelin), by R. Winston Menzel, no. 25, 83 pp., illus., printed. (Reprinted from Institute of Marine Science, vol. IV, no. 1, September 1955, pp. 70-153.) Oceanographic Institute, Florida State University, Tallahassee, Fla.

PAKISTAN:

The Mechanization of West Pakistan Fishing Boats, by H. Magnusson, C.S. Ohlsson, P. Gurtner and Jan-Olof Truang, FAO-ETAP Report no. 403, 82 pp., illus., processed. Food and Agriculture Organization of the United Nations, Rome, Italy, 1955.

"Preservation and Curing of Fish in East Pakistan," by Nazir Ahmed, article, Pakistan Journal of Science, vol. 5, no. 3, July 1953, pp. 117-122, printed in English. Pakistan Association for Advancement of Science, Lahore, Pakistan.

POND FISHERIES:

Barrages in Israel and their Utilization for Fish-Breeding, by Dr. A. Yashouv (Wirszubski), General Fisheries Council for the Mediterranean, Technical Paper no. 17, 10 pp., processed. Food and Agriculture Organization of the United Nations, Rome, Italy, October 1954. Barrages are natural seasonal ponds.

PRESERVATION:

"Icing Cod with Salt-Water Ice," by Paul Hansen, article, Industrial Refrigeration, vol. 131, no. 5, November 1956, pp. 20, 51, printed, single copy 25 cents. Nickerson &

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Collins Co., 433 N. Waller Ave., Chicago 44, Ill. Describes a pilot-scale investigation of the use of salt-water ice for the icing of "wet" cod. No systematic investigation was made on the raw fish, but the general impression was that the fish iced in "sea" water ice were less spoiled at the end of the experiment than those iced with ordinary ice. It seems that the over-all quality of sea-water iced fish gained more from the delay in spoilage than it lost through partial freezing and salt uptake. In the present experiment, however, the fish were iced with newly-prepared, homogeneous salt-water ice in proportions much above those used in practical icing of fish. Experiments on a more practical scale are therefore necessary before it can be seen whether salt-water ice may be of commercial value to the keeping quality of iced fish.

"The Radiation Preservation of Foods," article, Industrial Refrigeration, vol. 131, no. 5, November 1956, pp. 15-19, printed, single copy 25 cents. Nickerson & Collins Co., 433 N. Waller Ave., Chicago 44, Ill. Discusses the use of atomic radiation to preserve foods with a minimum of refrigeration by destroying insects and micro-organisms which promote decomposition and spoiling. Includes the following brief reports: "Nature of the Radiation Process," by Capt. Reuben Pomerantz; "Current State of Radiation," by Lt. Col. Truman F. Cook; "The Effect of Radiation Sterilization on Wholesomeness of Foods," by H. F. Kraybill; and "Future Potentialitites for Radiation," by Colonel William D. Jackson.

REFRIGERATION AND FREEZING:

"Influence of Freezing-Rate on the Denaturation of Cold-Stored Fish," by R. M. Love, article, Nature, vol. 178, no. 4540, November 3, 1956, pp. 988-989, illus., printed. St. Martin's Press, Inc., 103 Park Ave., New York 17, N. Y. Briefly reports the results of testing denaturation of fish frozen at different temperatures and rates of time.

RED SNAPPER:

"Alabama's Artificial Snapper Banks," by George Kyle, article, Alabama Conservation, vol. 28, no. 2, September 1956, pp. 4-7, 15, 25, illus., printed. Alabama Department of Conservation, 711 High St., Montgomery, Ala. Reports on experiments in making artificial banks in deep water in the Gulf of Mexico by planting used car bodies and heaps of scrap metal. This project was initiated when it was discovered by fishermen throughout the years that sunken ships and other hulks on the bottom of the sea prove to be good fishing spots. The artificial banks concentrate bottom-feeding fish such as snapper, grouper, jewfish, and spadefish, in an area where they can be more easily harvested by fishermen.

SALMON:

Contribution to a Biological Foundation for the Salmon Fishing Industry of the Amur Basin, by G. V. Nikolsky, 10 pp., processed. (Preliminary translation by W. E. Ricker from Trudy Soveshchaniia po Voprosam Lososevovo Khozialstva Dalnevo Vostoka (Proceedings of a Symposium on Problems of the Salmon Industry of the Far East), 1953, pp. 160-168). Fisheries Research Board of Canada, Biological Section, Nanaimo, B. C., Canada, 1956.

SARDINES:

Les Sardinelles de la Region de Pointe-Noire--Perspectives Economiques Qu'elles Offrent (Sardines from the Zone of Pointe-Noire--Their Economic Prospects), Science et Peche, no. 31, December 1955, 6 pp., printed in French. Institut Scientifique et Technique des Peches Maritimes, 59 av. R. Poincare, Paris 16, France.

A Statistical Contribution to the Study in Ecology of Sardine (SARDINA PILCHARDUS) in the Central Adriatic, by Sime Zupanovic, Acta Adriatica, vol. VII, no. 10, 1955, 31 pp., illus., printed. Institute of Oceanography and Fisheries, Split, Yugoslavia.

SHARKS:

"Victory over the Shark," by Ralph N. Hill, article, Natural History, vol. LXV, no. 7, September 1956, pp. 352-356, illus., printed, single copy 50 cents. American Museum of Natural History, Central Park West at 79th St., New York 24, N. Y. Vividly describes the search for a repellant against sharks to protect men adrift in life belts or rafts. The author gives a detailed account of the scientific project and how it originated; experiments conducted in laboratory tanks with dog sharks; eventual discovery of copper sulphate, ammonium acetate, and other powerful repellants; search for a shark-infested ocean area suitable for further testing; experiments in the ocean and discovery of almost magical results with copper acetate; and effective methods of using copper acetate to repel sharks.

SHELLFISH:

Oyster and Mussel Culture, Rapports et Proces-Verbaux des Reunions (Reports and Verbal Proceedings of Meetings), vol. 140, part III, 61 pp., illus., printed in French and English, Kr. 17 (US$3.28). Conseil Permanent International pour l'Exploration de la Mer (International Council for Exploration of the Sea), Charlottenlund Slot, Denmark, January 1956.

SOUTH CAROLINA:

Harvest from an Experimental One-Acre Salt-Water Pond at Bears Bluff Laboratories, South Carolina, by G. Robert Lunz, Contributions from Bears Bluff Laboratories No. 21, 2 pp., printed. (Reprinted from Progressive Fish Culturist, vol. 18, no. 2, April 1956, pp. 92, 93, 94.) Bears Bluff Laboratories, Wadmalaw Island, S. C.

Mosquito Fleet, by Francis B. Taylor, 4 pp., illus., printed. (Reprinted from Bulletin of the International Oceanographic Foundation, vol. 2, no. 1, March 1956.) The Marine Laboratory, University of Miami, 439 Anastasia Ave., Coral Gables 34, Fla. Briefly discusses the recent growth of marine fisheries in South Carolina and especially mentions that most fishing was formerly accomplished by the

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"mosquito fleet," crazily-rigged boats which are now being replaced with modern boats and equipment. Also discusses the need for research of near-shore and deep-sea fish and of shrimp, oysters, and crab. The author states that "under-utilization of the State's fishery resources could be even more a waste than overfishing. How to strike a balance between the biological factors and the economics of fishing pressure calls for uninterrupted research of local conditions and enforcement of enlightened laws."

SWEDEN:

Fiske, 1954 (Fisheries, 1954), 78 pp., illus., printed in Swedish with summary in English. Central Bureau of Statistics, Stockholm, Sweden, 1956. An account of the fisheries in Sweden in 1954. Contains statistics mainly relating to salt-water fisheries. The decline observed for several years past in the total number of fishermen continued during 1954. The primary reason for this is apparently the decrease in the supply of fish in certain areas and the fishermen's consequent adoption of some other occupation. The coastal industries have frequently offered more regular and, above all, higher incomes. At the end of 1954 the total number of fishermen was 19,552, of whom 11,731 were professional fishermen. In addition to discussions of the salt-water fishery and the fresh-water fishery, statistics are given for the number of fishermen, fishing gear, and fishing craft in the salt-water fishery, by counties, in 1954; quantity and value of fishery products in different fishing areas and by counties; and the salmon and whitefish fisheries, etc., in certain rivers in 1954. A list of fish and shellfish in Swedish, Latin, and English is also presented.

TURTLES:

"Our Vanishing Sea Turtles," by Chapman Grant, article, The Scientific Monthly, vol. 83, no. 5, November 1956, pp. 257-258, printed, 75 cents single copy. The Scientific Monthly, 1515 Massachusetts Ave., N.W., Washington 5, D.C. Discusses briefly the need for uniform legislation and conservation efforts to protect sea turtles from extinction.

TURKEY:

Balik ve Balikcilik (Fish and Fishery), vol. IV, no. 12, December 1956, 26 pp., illus., printed in Turkish with table of contents in English. Et ve Balik Kurumu, Istanbul, Turkey. Contains articles dealing with trawling in Turkish sea waters; methods of fish extraction by the use of vertical and horizontal boiler systems; biology of tuna and recommendations about new gear to the Turkish fishermen. A general survey of electricity-producing fish is also described. Recommendations about trawling methods in the Black Sea are given, and the future of Turkish fishing boats is discussed.

UNITED KINGDOM:

Sea Fisheries Statistical Tables, 1955, 38 pp., (mostly tables), printed, 4s. (56 U.S. cents). Ministry of Agriculture, Fisheries, and Food, London, England, 1956. (Available from Her Majesty's Stationery Office, London). Includes statistics on the quantity, total value, and average value of fish and shellfish production in in Great Britain (mostly England and Wales) by species, region, and other categories for 1955. Breakdowns by first-class British vessels, demersal landings, and pelagic landings are presented. Data on imports and exports are included. Also given are the number of fishermen, number and gross tonnage of vessels, and and number of first-class vessels by stations and type of gear.

U.S. CONGRESS:

Fisheries Legislation, Hearings before the Committee on Interstate and Foreign Commerce, United States Senate (Eighty-fourth Congress, second session on S. 2379, S. 3275, and S. 3339.), 299 pp., printed. Committee on Interstate and Foreign Commerce, Washington, D.C., 1956. (Available from Superintendent of Documents, Government Printing Office, Washington 25, D.C.)

Editorial Assistant--Ruth V. Keefe Illustrator--Gustaf T. Sundstrom

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Photograph Credits: Cover--P. Wilson; pp. 1 and 2--E. D. Stroup; p. 46--H. R. Bullis; p. 60--R. P. Elliott. Photographs on pages not mentioned were obtained from the Service's file and the photographs are unknown.

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## SHRIMP FILM AND RECIPE BOOK ARE NOW AVAILABLE

Time-tested shrimp recipes are featured in the latest United States Fish and Wildlife Service sound and color fishery market development film. The film is available at many of the 140 public and private libraries which handle the Service's commercial fishery films. The film is especially designed for black-and-white or color television use.

Peppered Shrimp and Eggs

Also available is a new full-color shrimp recipe book. Both the film and the recipe book bear the title, Shrimp Tips from New Orleans. Both were produced by the U. S. Fish and Wildlife Service in cooperation with the Peelers Company of New Orleans, manufacturers of shrimp peeling and deveining equipment. The Peelers Company financed both the production of the film and publication of the book. Additional copies of the book were purchased by the Government for resale to the public through the Government Printing Office.

The film, with its New Orleans setting, authentically portrays the culture, architecture, art, and music of that famous city, with the strains of French cafe and modern Dixieland music lending additional atmosphere to the scenes. Preparation and serving of six recipes is woven colorfully into the 14-minute film.

The recipe book (Circular No. 41) contains 18 recipes, including the six which are explained in the film. It is a 20-page booklet with 17 of its pages showing shrimp dishes in natural color. Water colors of the Old and the New South lend added appeal to the publication. Ingredients of all of the recipes such as those for Shrimp Amadine, Remoulade, Creole, or Jambalaya, are available at any market and are usually already in the home kitchen.

The recipe book is for sale by the Superintendent of Documents, Washington 25, D. C. The price is 15 cents with a 25-percent discount on orders of 100 copies or more.

Organizations may borrow the film free of charge. For information on the film write the United States Fish and Wildlife Service, Washington 25, D. C.